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PIPE LINE INDUSTRY

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French Lay Line 2,500 Ft. Deep in Tests 16

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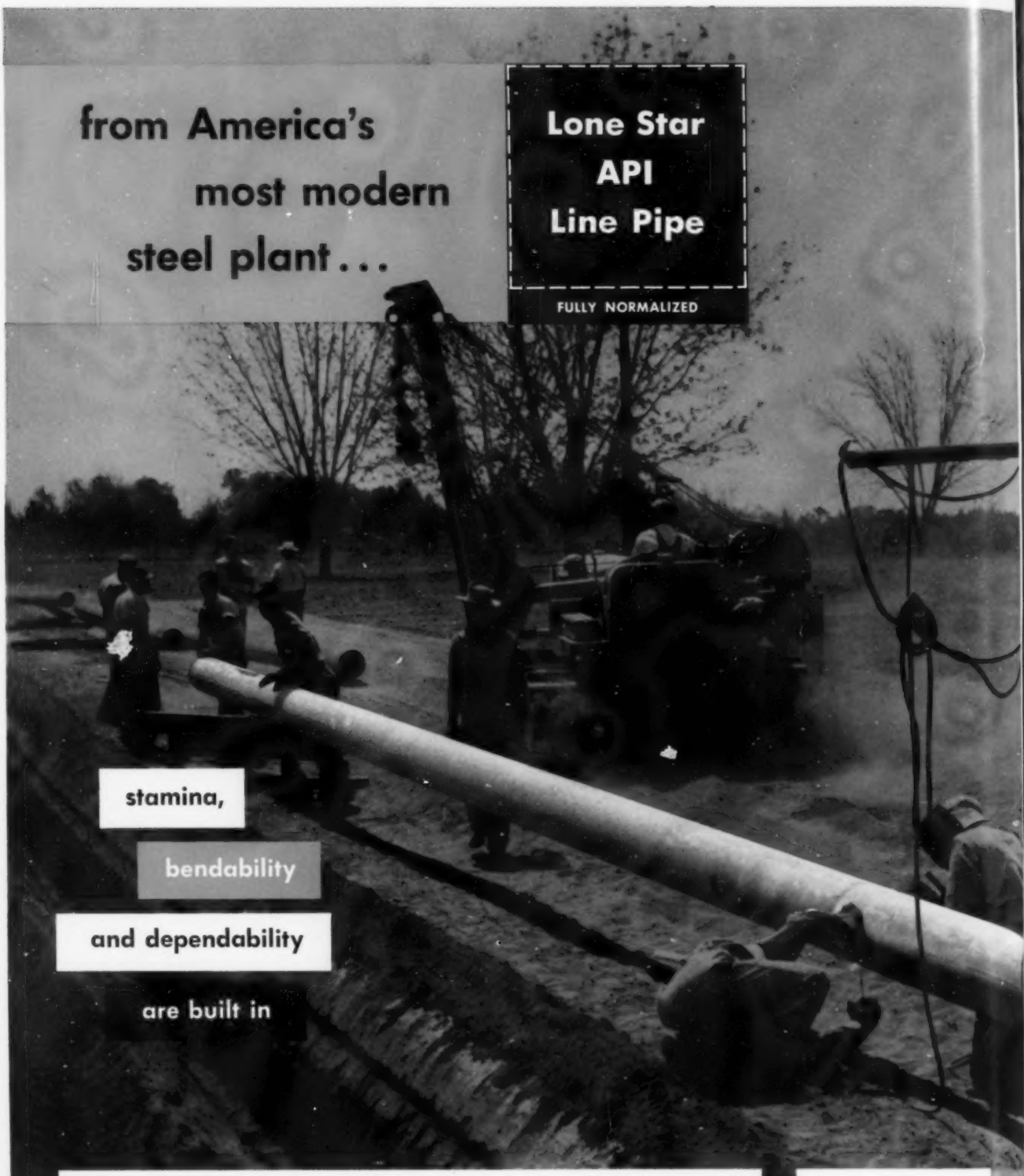

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WORLD OIL (formerly the Oil Weekly) and The COMPOSITE CATALOG for the drilling-producing industry.

PETROLEUM REFINER and the REFINERY CATALOG for the Hydrocarbon Processing Industry.

Indexed by Engineering Index

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and Quick Look

August 1961, Vol. 15, No. 2

To help you put first things first, scan these time-saving digests, checking √ those you want to read first.

☐ **French Lay Pipe in 2,500 Feet of Water . . .** for Practice! A new technique that opens the door to deep-water pipelining. The keys to the operation are a polystyrene buoy which will withstand deep water and high pressures and a "breathing buoy" with a compressible bladder. A Mediterranean crossing is now possible.

Donald M. Taylor ..... Page 16

☐ **Trunkline's New Road Boring Technique** paid off in a big way recently in Mississippi. When the contractor attempted to bore under 320 feet of highway, sandy clay stuck the pipe at 210 feet. Trunkline devised a new method to solve the problem.

V. R. Vincheloe ..... Page 25

☐ **Self-Supporting Pipe Arch Spans 150-Foot Wide Canal.** For years pipeliners have dreamed of pipe spans made entirely of carrier pipe with little or no external bracing. Laclede Gas Company has installed such a structure.

William H. Donnelly and Edward V. McMullin ..... Page 27

☐ **Dispatching Gas by Pushbutton.** Peoples Natural Gas Company is controlling five meter and regulator stations from its Pittsburgh dispatcher's office. Supervisory system is an adaptation of a system designed for missile testing. All telemetering is digital.

A. F. Kraus, H. M. Joiner and L. B. Lumpkin ..... Page 31

☐ **How to Run a Testing Program.** Most management people agree a good testing program is a valuable tool. But to get the best results, be sure to consider certain points before, during and after launching such a program.

John D. Quinton ..... Page 37

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How to Win Friends for Your Industry—Kit

"EVERYBODY TALKS about public relations but nobody does anything about it." (Our apologies to Mark Twain.) The first part of the above statement is generally true in the pipe line industry, and too often the second portion has been true, also.

But this condition must change for the long range welfare of this sector of the oil and gas industry and it will if enough people work to improve public understanding. Last week we received a letter from the American Gas Association announcing an important new tool to help *anybody* become an apostle for the gas industry. AGA calls this a "Speaker's Kit . . . Word Tools to Sell the Story of Gas". And these "word tools" are sharp and strong with the substance of facts about the industry.

Here are the tools in the AGA kit which you can use to repair public understanding of the gas business or pipelining in your own neighborhood.

. . . "Face to Face . . . How to Win Friends for Gas Through an Organized Speakers Program"

This 20-page booklet covers use of the spoken word, reasons for a speakers' bureau and how to get it going, ideas for developing skills, techniques, *how to get an audience and what to do after it has gotten you.*

. . . "66 Ways to use Visual Aids in a Company Speakers' Program" has 66 good ideas to help your audience "see" your message while listening to what you have to say. These are worth reading. You can find a new thought in "66 Ways . . . " even if you may have completed a leadership course, been a program chairman, or even a president of an industry group. Michigan Consolidated Gas Company's GASARAMA is one excellent program cited here.

. . . Four other pieces provide background information should you need some more facts

"Historical Highlights" gives exciting facts about natural gas dating from seepages at Mount Parnassus in Greece which fueled the Oracle of Delphi in 1000 B.C. up to today when a natural gas pipe line network has grown to serve all of the states in the Continental United States except two, and gas pipelining has already stretched into Alaska.

"Gas Industry Statistics" draws on GAMA, FPC, Bureau of Mines, and Chase Manhattan Bank researchers as well as the AGA's own Bureau of Statistics to give lots of numerical facts plus five pages of statistical data about the gas industry.

"Source Materials for Speakers" tells where you can get "handouts" to accompany your speech and how much they will cost you. One section of this directory lists ten publications available for reference and quantity distribution at your meeting; another lists 22 booklets and materials available for your reference or for limited distribution. A selected list of 26 movies tells their coverage, technical specifications and where they may be obtained in case you are bashful after you get on the program.

"Public Issues Facing the Gas Industry" gives you some ammo whether you are a "supercharged" Republican still full of fight or a "hearty winner" Democrat trying to do a little courting for the industry. Remember, citizens who could be writing to their Congressional representatives in Washington will have to have the facts, too.

If you are extremely busy but your boss has you "hooked" for a speech somewhere then you may find useful one of the eight pattern speeches in the kit. They are all ready to go and cover these subjects: "Our Most Valuable Resource . . . What Gas Research is Doing for Modern Living . . . Gas, the Perfect Servant . . . The Industry that Thinks about Your Safety . . . America's Stake in Free Competition Among Energy Fuels . . . How Gas and Government Cooperate to Serve the Public Interest . . . America's Transportation Miracle . . . How the Gas Industry Helps America Achieve its National Goals . . . "

If you are interested in doing a little extra for your industry here's your chance. James M. Beall, Director of Public Information, American Gas Association, 420 Lexington Ave., New York 17, N. Y. says a limited number of extra kits is available to take care of special requests. In addition, speeches and other material in the kit can also be reproduced by your own facilities if quantity distribution within your company is the goal.

There are all sorts of good reasons for building understanding of the gas industry and pipe line operations by speaking out. In a recent course on leadership and public speaking we learned of a couple poor ones. A bachelor we know exceedingly well was there to meet beautiful, charming and eligible gals (he did) and a much married man with seven children said, "he just wanted to get out of the house one night" (he did, too).

Maybe these reasons aren't such poor ones after all. Whatever your reason, we recommend some public relations effort on your part as worthwhile and fun if you can take the time.

Melvin A. Judah

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Special report to users of Caterpillar equipment

CAT CATERPILLAR

Parts you can trust
...cost less per hour

New Cat parts stretch dollars "down where the digging's going on"

That's more than just talk! More and more users are conducting their own field trials of ground engaging tools—tips, bits, teeth and edges—to determine which brand gives them the best performance-cost balance. And time after time, they find that genuine Caterpillar ground engaging tools outclass all comers—in production and over-all economy!

Take Cat cutting edges. These edges have been contractor-tested with most of the market's leading brands all over the country. Results: Cat edge wear life—10-60% longer. Cat edge cost—15-50% less per hour. Think of that in terms of dollars!

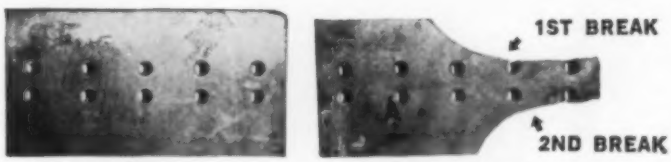
HERE'S A LOOK AT RECENT FIELD TRIALS ON SCRAPER CUTTING EDGES:

Two DW21-470 Scrapers, one with Cat *standard* edges and one with popular brand *thick* edges, were put to work "side-by-side" by a contractor in hard, red clay on an Interstate Highway job. His findings:

Brand	Price	Hours of Life	Cost per Hour
Other	$121.22	1060	$.114
Cat	$128.28*	1360	$.094

HIS SAVINGS WITH CAT EDGES—17.5% PER OPERATING HOUR

*Test completed before recent new low price of $102.30 effective.



CATERPILLAR OTHER BRAND

A Cat 7/8" stinger and another brand *one inch thick* were split in half and a section from each installed on *same* DW21-470 Scraper working in decomposed lava with embedded basaltic boulders. Other brand section broke after 48 operating hours, was reversed but broke again two hours later—a total of 50 hours of life. *Cat edge wear during period was 1/4", other brand 1/2".*

Your Caterpillar Dealer has the facts on many of these tests—go over them with him and start to save more now.

Caterpillar continually up-dates its line of ground engaging tools. Some of the newcomers to the line that "stretch your dollars" are: new self-sharpening end bits and ripper tips, patented reversible router bits, and new-design scarifier teeth for Motor Graders. These new money-savers keep production high, costs down.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

CATERPILLAR

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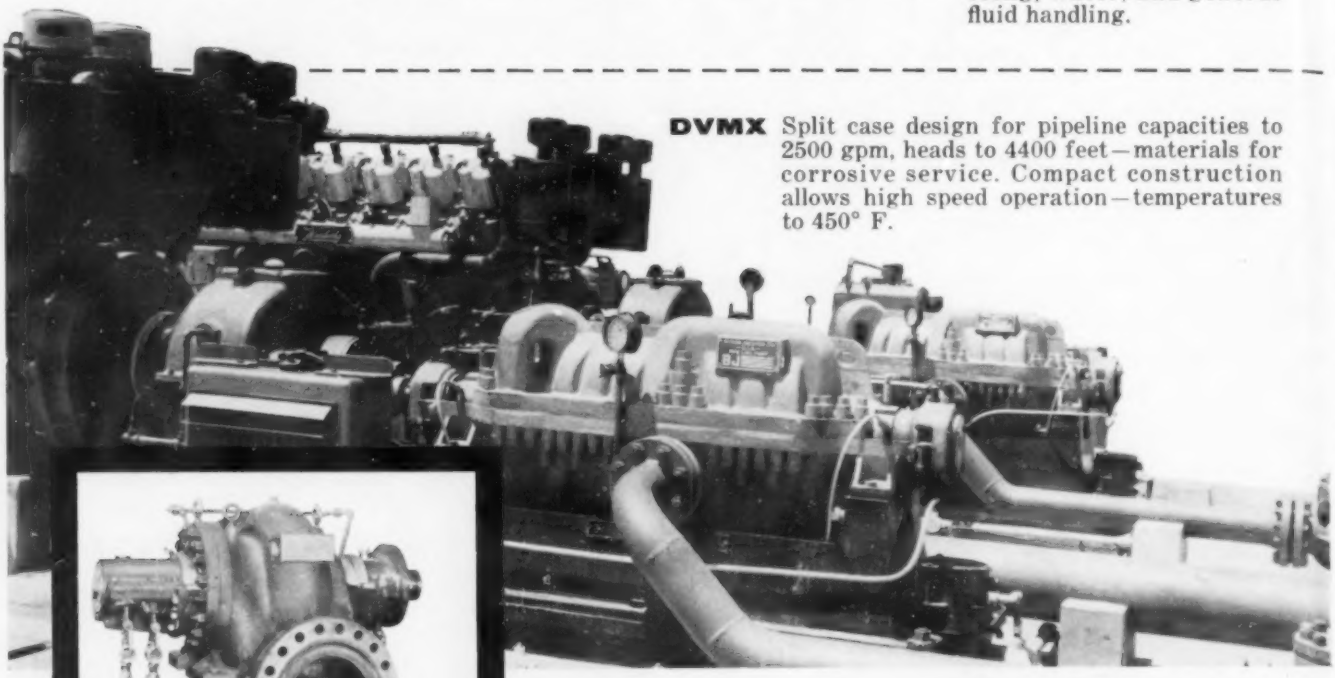
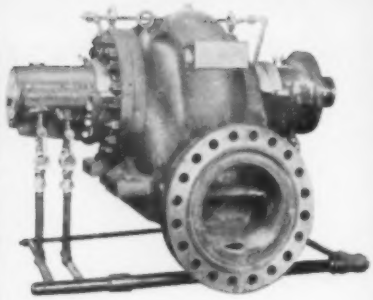
BJ Pipeline Pumps

Quality Pumps... Delivered on Schedule!

BJ offers a complete line of proven pipeline pumps — with on-time delivery! Other BJ quality centrifugals are available for associated process pumping, transfer, booster, field gathering, water, and general fluid handling.



DVMX Split case design for pipeline capacities to 2500 gpm, heads to 4400 feet—materials for corrosive service. Compact construction allows high speed operation—temperatures to 450° F.



GAS TURBINE

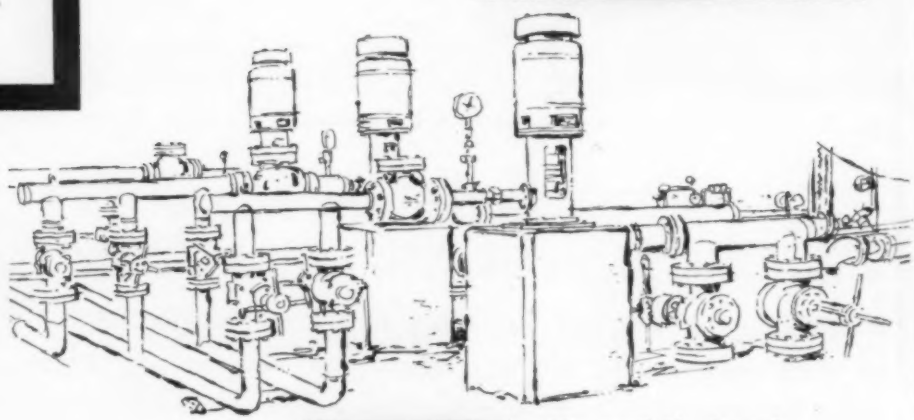
High speed, double-suction pipeline pumps for turbine drive. Installed for capacities to 17,000 gpm, heads to 1,700 feet, speeds to 6300 rpm and up.

BILTON

Compact pump and motor, close-coupled for versatility. Mounts in any position. Capacities to 2000 gpm, heads to 450 feet, motors to 60 hp.

VLT-VMT

Vertical pumps for limited NPSH, corrosive or non-corrosive service over a wide temperature range. Standard VLT models to 1800 gpm, larger VMT series for almost any capacity.



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NEBULA EP-1 offers these economies:

- *One* grease bought in quantity — tubes, pails or drums
- Reduced inventory and handling
- A multi-use grease always handy

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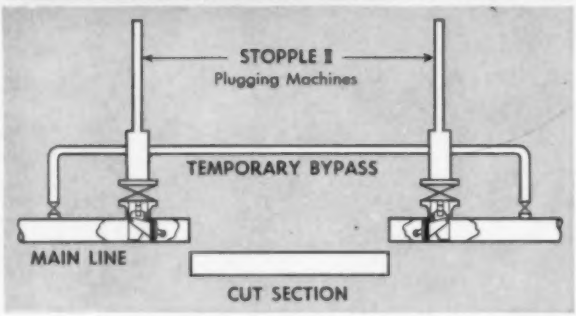
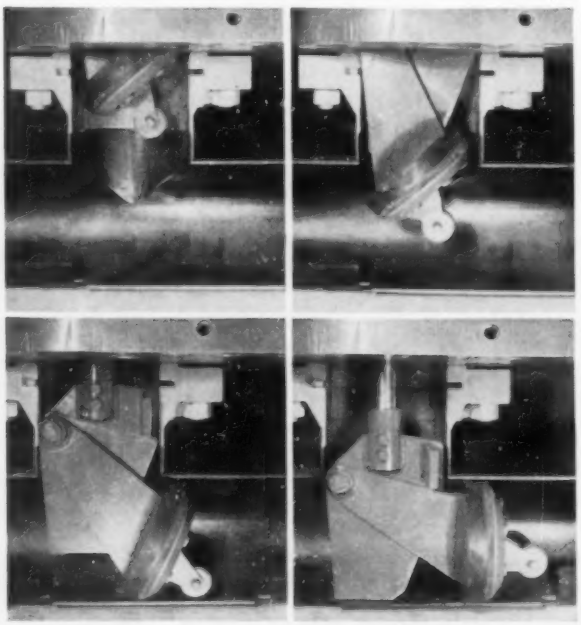


❶ "This method of plugging a line and bypassing the flow has been used extensively in plant and field operations with WMSon tapping and STOPPLE equipment. Many costly shutdowns have been avoided. Now, WMSon engineers have re-designed and improved the STOPPLE Plugging Machine. Result . . . the all new STOPPLE II . . . offering hydraulic operation, improved, simplified construction, and economy—**real** economy!"



❸ "Here's how STOPPLE II works. After the tap is made, the STOPPLE II is mounted on a WMSon SANDWICH Tapping Valve, and the plugging head is lowered into the line, stopping the flow completely. New single link construction of the plugging head offers built-in simplicity . . . and strength for high pressure plugging."

NEWS FROM DOWN THE LINE!

NEW economy
NEW improved design
NEW interchangeable plugging heads . . .

WMSON'S ALL NEW STOPPLE® II

Plugging Machine for piping modification or repair WITHOUT SHUTDOWN!

❷ "Here's the major reason for this economy. The STOPPLE II has a hydraulic cylinder that is interchangeable with plugging heads of different sizes. For example, one hydraulic cylinder can be used on a 14", 16", 18" or 20" line by using it in combination with a plugging head and housing of the proper size."

•

WMSon STOPPLE II with hydraulic operation is available in sizes 8"–30". The 4" and 6" units are hand operated. Single link is standard in all sizes. Write for additional information and specifications: Write Dept. E for Bulletin A-513.

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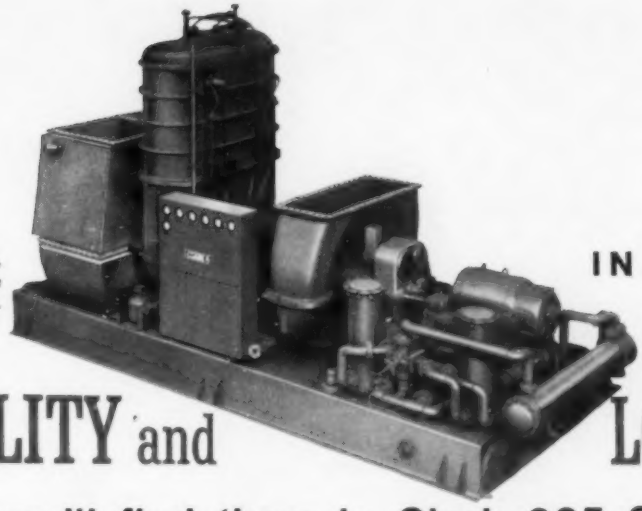

Clark Model 305-S, single shaft gas turbine rated at 9000 hp.

IN GAS TURBINES YOU LOOK FOR

RELIABILITY and LOW FIRST COST

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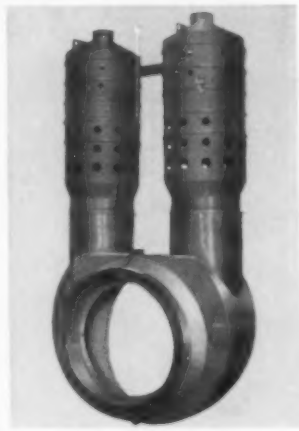
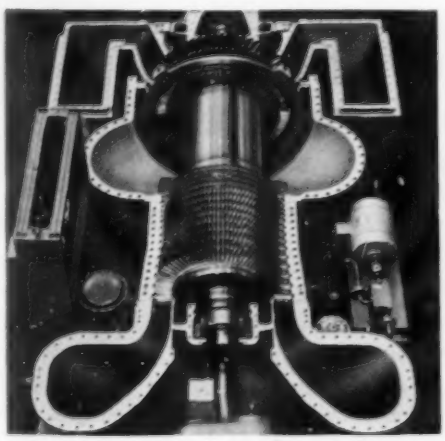
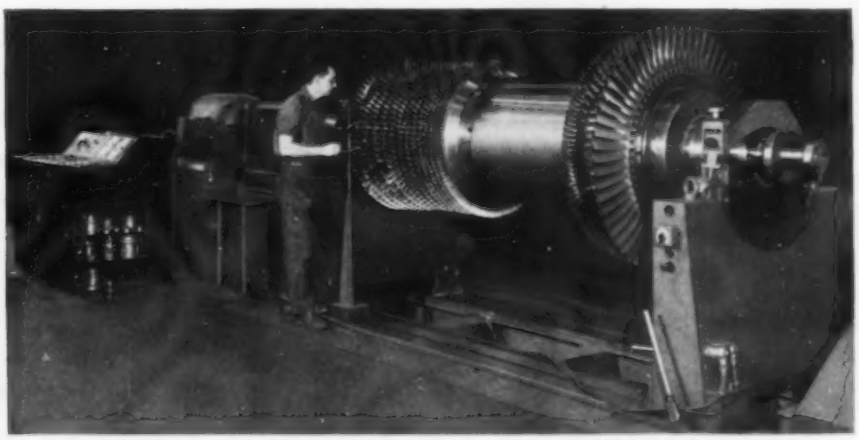
- **Heavy Duty Industrial Design**—Simple, open cycle machines, built for continuous, full load operation . . . ideal drivers for compressors, generators and pumps.
- **Single Shaft Construction**—Provides high rotating inertia and minimum speed variations under transient load conditions. Two-Shaft units available for applications requiring wider operating flexibility.
- **Design Simplicity**—Integral compressor-turbine rotor is supported by two readily accessible journal bearings. Entire unit including combustion system is contained in common casing structure.
- **1400°F Operating Temperatures**—Insure long life of hot parts plus substantial margin of safety.
- **Air Cooled**—Pressurized air cools high temperature components . . . air envelopes minimize heat loss and operating temperatures wherever possible.
- **Vertical Combustion Chamber**—Prevents direct flame impingement on turbine blading . . . assures more uniform heat distribution.
- **Horizontally Split Casing**—Upper half can be removed in one piece to remove rotor . . . inspections quickly made using light lifting equipment.
- **Renewable Labyrinth Seals**—Of honeycomb construction . . . minimize leakage at all close clearance points on turbine shaft.
- **Proved Reliability**—Materials of construction and important components such as turbine blade root design, turbine discs, journal bearings and axial compressor based on broad Clark experience in building heavy duty gas turbines.



Unitized combustion chamber with two parallel burners, each enclosed in a liner of high temperature nickel chrome alloy.



Single rotor is supported by two journal bearings for greatest simplicity. Horizontally split housing provides easy accessibility.



Rotor is statically and dynamically balanced for optimum performance. Turbine blades are of high temperature forged steel. Air streams cool turbine blade roots and both sides of discs.

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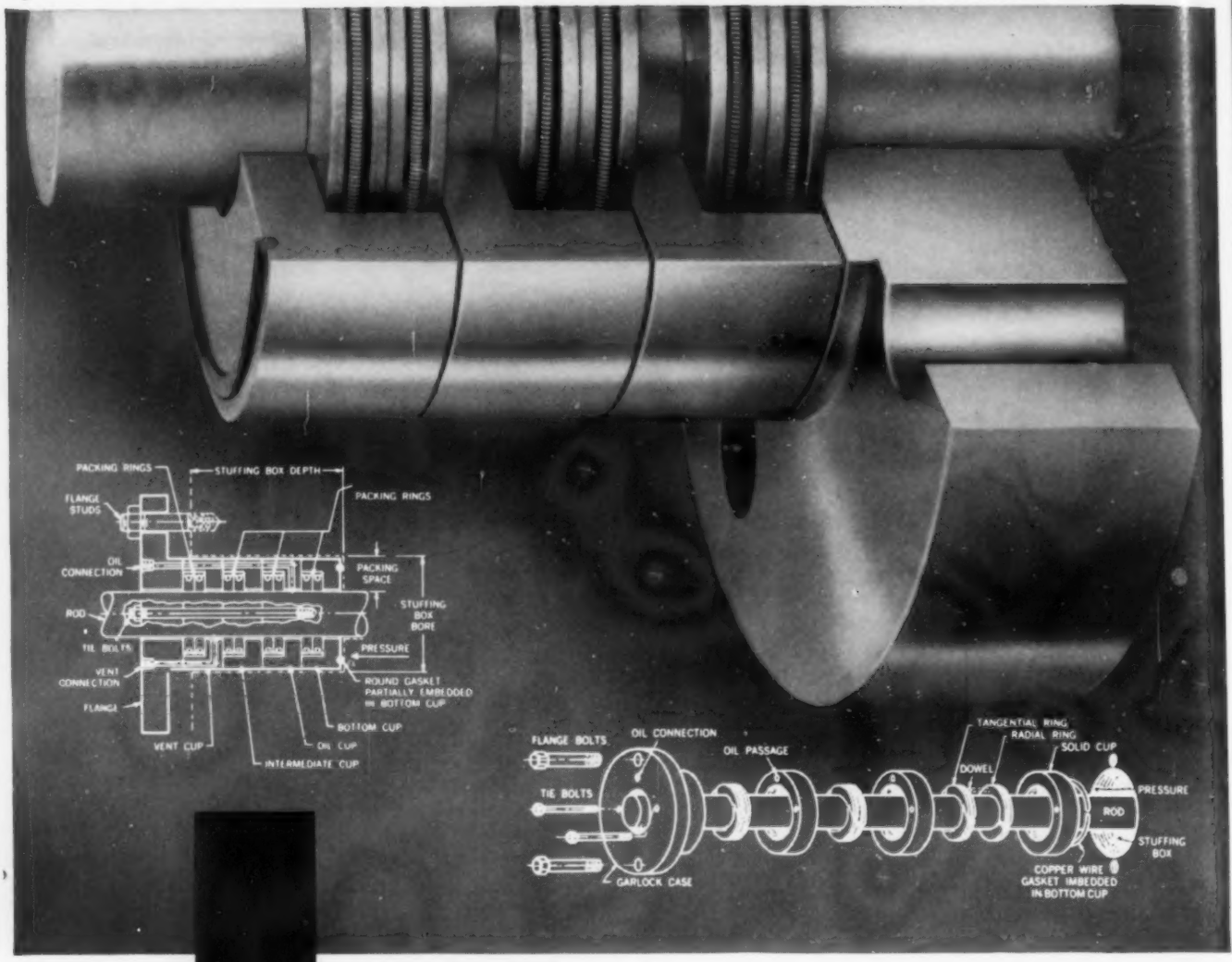

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Packing rings super-finished to a flatness measurable in light bands. Only Garlock gives you such precision finishing—such a positive seal between ring and groove. And, thanks to an exclusive Garlock manufacturing technique, this super-finish is yours without additional cost.

A style and material for every application. Quality-made to exact specifications, Garlock Metal Packing Rings are available in Graphitic Cast Iron, Bronze, Carbon, Babbitt, Amberite laminated phenolics and Teflon*. Whichever you require, you can be sure of the finest metal packing available.

These rugged standards must be met by every Metal Packing Set leaving the Garlock factory:

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2. Gas-tight seal between rings and packing groove.
3. Packing must not be affected by operating conditions.
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5. Packings must have no adverse effect on compressor rod.

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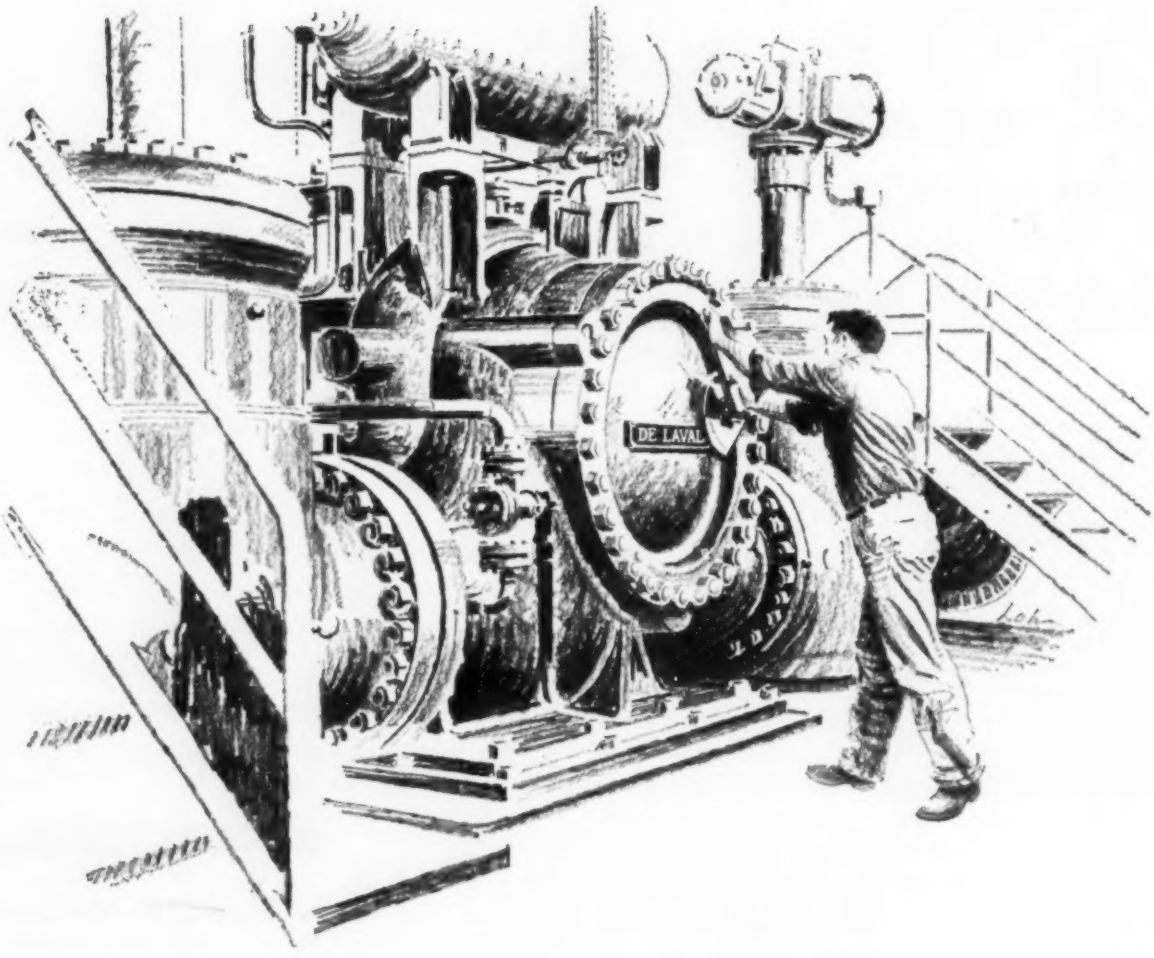
as pipelines grow

De Laval centrifugal compressors that boost gas through pipelines are a good example of De Laval engineered flexibility. Just two changes in parts — impellers and diffusers — increase compressor capacities and pressure ratios. Fluid flow keeps in economical step with growing demand.

Many companies face problems caused by fluctuating production levels, variable or interrupted operations, steady or rapid growth. To help solve such problems, De Laval engineers maximum flexibility into all of the many products it furnishes to industry.
De Laval Steam Turbine Co., Trenton 2, New Jersey.



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PIPE LINE PANORAMA

Pipe Line Construction Gains Momentum . . . FPC log jam has untangled slightly—international activity is on the upswing. Result: Recovering sharply from virtual standstill in March, more than 9,000 miles of construction is under way here and overseas.

More than 6,000 miles of U.S. construction includes Pacific Gas and Electric and Pacific Gas Transmission section of Alberta to San Francisco gas line (600 miles, 36-inch); Dixie Pipe Line's LPG system (1,100 miles, 6-12-inch); West Shore products line (285 miles, 10-16-inch); also, United Gas Pipe Line, Texas Eastern, Transcontinental, Texas Gas, Trunkline, and Northern National expansion programs.

International projects of major significance are France's Lavera to Strasbourg line (430 miles, 34-inch); ENI crude system in Italy with extension to Switzerland (600 miles, 18-inch); two crude lines in Libya; Burmah Oil Company's 250-mile, 16-inch crude line in India; Alberta Gas Trunk Line and Alberta Natural Gas Company's Canadian section of Alberta-San Francisco gas line (500 miles, 36-inch); and 500-mile, 12-inch crude line for Western Pacific Products and Crude Oil Products, Ltd., in Canada.

Exclusive report on West Shore's line will be published in September PLI.

Complete Turnover in FPC Staff by '62? . . . Confusion continues in the Federal Power Commission with sudden shake up in staff: **Chairman Kuykendall has given up fight** and is turning reins over to Joseph Swidler September 1, with strong indications he may resign before year's end . . . **Sudden death of Commissioner Frederick Stueck** created unforeseen vacancy, with speculation "independent" Republican Robert Weston, an FPC examiner, will fill post . . . So, with Swidler and Morgan appointed to FPC in recent weeks, and former Oil and Gas Administrator Larry O'Connor in throes of Senate confirmation, **it is entirely feasible President Kennedy will have a "green" five-member FPC staff before '62—to tangle with morass of pipe line construction applications that seemingly never catches up.** At June's end there were 179 pipe line projects hanging fire totaling 6,487 miles.

New Statistics Show Pipe Line Investment Picture . . . Interstate Commerce Commission reports oil pipe line property investments totaled $3.3 billion at 61's end, up $111 million or 3.5 percent over $3.19 billion at year's beginning. Investment breakdown is as follows:

Trunk lines—$2.9 billion, up $101 billion during the year.

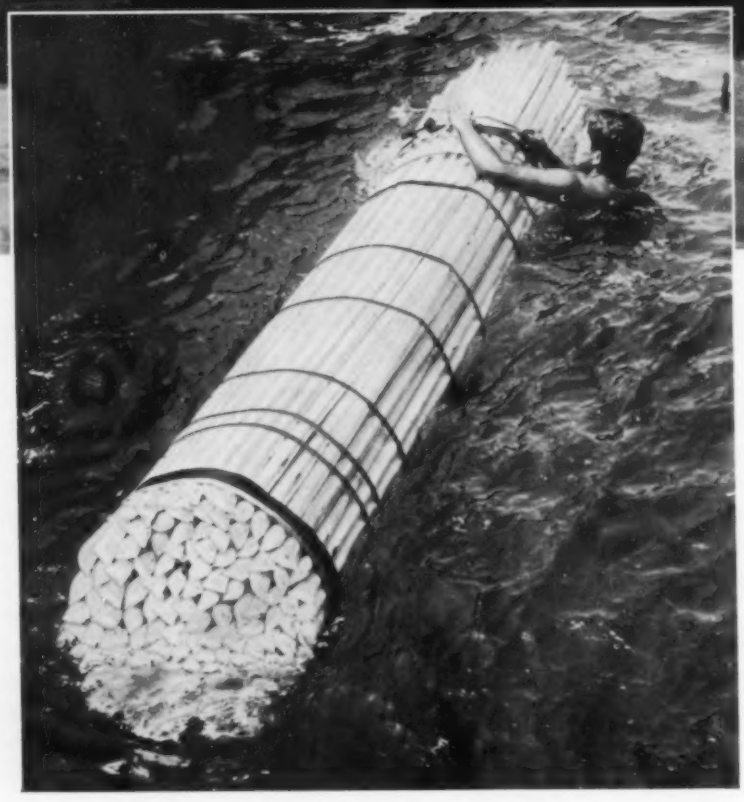
Gathering lines—$340.4 million, up $5.7 million.

Other investments—$57 million, up $623,000.

Chase Manhattan reports U.S. gas utilities, including transmission lines, spent $1.9 billion in '60 to expand plant and pipe lines. Gross investment in fixed assets totaled $21.5 billion at year's end. Also, marketed production of natural gas increased to 12.7 trillion cubic feet last year, compared with 12 trillion in '59. Average well head gas price increased from 12.9 cents to 13.6 cents per Mcf.

Pipe Line Briefs . . . Look for distribution contractors from more than 20 states, plus some main line contractors, to form new distribution association soon; liaison between main line and distribution groups also is being considered . . . **Mexico's government oil agency will spend $36 million** on 1,000 miles of new product and gas lines before year is out . . . **FPC has thrown up major roadblock that may curb transmission company trend toward in-place purchases of natural gas reserves**; from now on, FPC will have control of prices paid for in-place reserves. First hearing will be held October 23 on Texas Eastern's reserves purchase in Louisiana's Rayne field . . . **Proposed federal legislation to charge 2-2½ mills "users' toll" per-ton-mile on all interstate inland waterway shipments** will chase 30 percent of current waterway business (petroleum accounts for this percentage) to the pipe lines, so states National Waterways Conference, Inc. . . . **New Humble Pipe Line will move more crude and products than any line in the U.S.** (more than 1 million barrels daily); however, will be second to Service Pipe Line in mileage (12,500 miles, vs. 14,925 miles).

French



TWO NEW BUOYS have opened the doors to deep water pipelining. At the left is a bundle of polystyrene floats which will withstand the crushing force of deep water. They are expensive but adequate. Resting on the pipe as it is launched is a breathing buoy

Lay Pipe in 2,500 Feet of Water—for Practice!

This new technique can mean low-cost pipelining in deep water. Gas lines across the Mediterranean will follow

(above). The breathing buoy is the key to French deep water pipelining. It supports the long free span of pipe in the water. Holes in bottom of buoy admit sea water. This in turn compresses the nylon and rubber bladder, progressively lowering its buoyancy.

By Donald M. Taylor, Engineering Editor
PIPE LINE INDUSTRY

AT SUNUP one morning last fall, the 1,000-hp French tug, *L'Utile* was steaming out into the Mediterranean about 10 miles off the coast of Algeria. At her stern, she towed 8,700 feet of submerged pipe—its passage marked at the surface only by an occasional red buoy. Two miles astern, another tug, the *Jean Amedee,* was attached to the tail end of the pipe to hold it in tension and provide buoyancy. Other small vessels sailed a parallel course to either side of the submerged tow.

The objective was an 8:30 a.m. rendezvous at an area about 15 miles off the North African coast where the water is 2,300 to 2,600 feet deep.

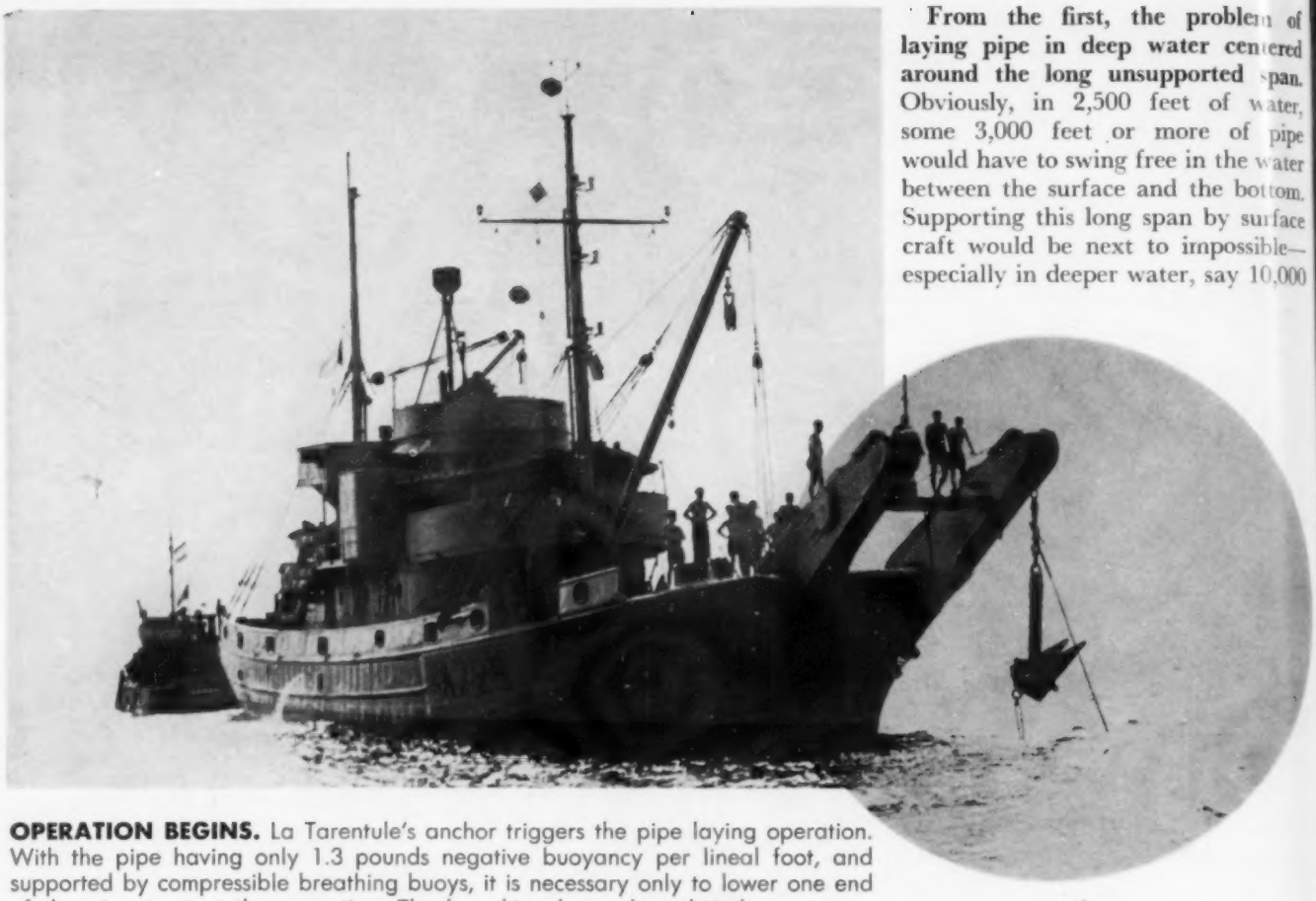
Here, Gaz de France pipeliners would attempt to lay the pipe line on bottom of the half-mile-deep Mediterranean, recover it and return it to its moorings in the Bay of Mostaganem—all in one day's time!

And to accomplish this feat, the French were using only four light vessels—two of which were harbor tugs. Not included in this number, however, were various observation vessels in attendance.

The French were so sure of their success that they had invited dignitaries, including a member of the French Cabinet—Minister of Industry, M. Jeanneney—to witness the operation.

If you're a pipeliner, you're probably thinking that these Frenchmen went to considerable trouble to stick their necks way out. For on offshore pipe line construction, the so-called Murphy's Law that has haunted U.S. space efforts, not only works, it has been amended to read, "If anything can go wrong, invariably it *will* go wrong. What's more, some of the things that can't go wrong, will go wrong, too, and this will occur at the most inopportune time."

But these French pipeliners were confident. For seven months they had battled the sea, field-testing the new method of laying underwater pipe



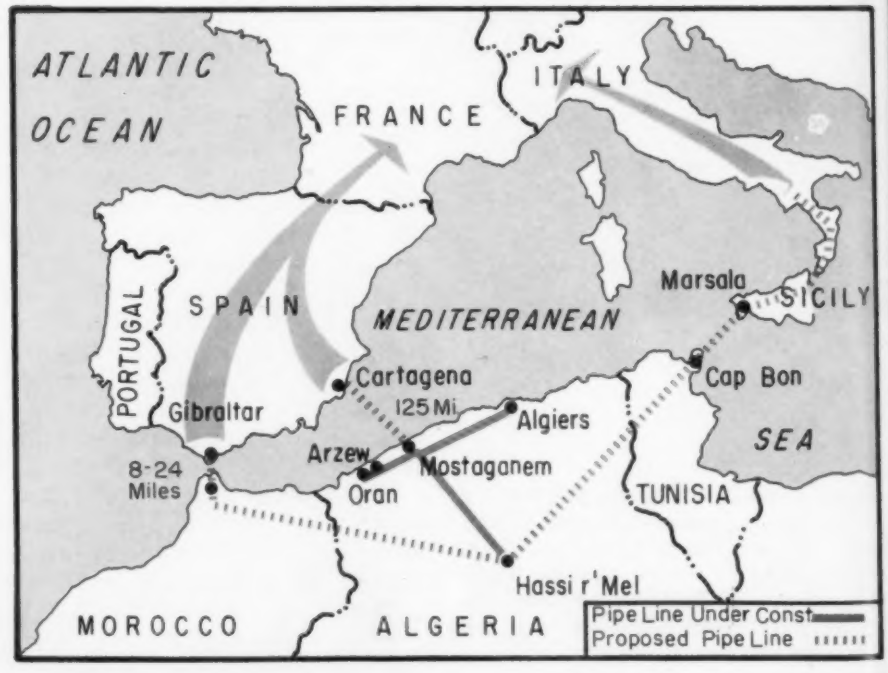
OPERATION BEGINS. La Tarentule's anchor triggers the pipe laying operation. With the pipe having only 1.3 pounds negative buoyancy per lineal foot, and supported by compressible breathing buoys, it is necessary only to lower one end of the pipe to start the operation. The breathing buoys lose their buoyancy as they submerge, lowering the pipe smoothly to the ocean floor.

lines. They had buckled pipe, crushed buoys, failed and started over during this period; and they were supremely confident that the method they had devised would work.

To better understand the problems they faced and the ingenious solutions they produced, let's briefly review what had gone before. The 8⅝-inch, 0.433 wt pipe had been welded up into a number of 820-foot sections which were coupled together with special collars as they were launched into the sea. The pipe weighed 37.7 pounds per lineal foot in air and about 12 pounds in water. Polystyrene floats and, in some cases, containers of gasoline were clamped to the pipe, reducing its weight in water to 1.34 pounds per foot.

"Breathing Buoys". To reduce the weight of the pipe to zero, specially made "breathing buoys" were attached to the pipe every 150 meters (495 feet). These buoys supported the pipe as it was being towed to sea; but more important they provided the key to a new concept in offshore pipelining.

From the first, the problem of laying pipe in deep water centered around the long unsupported span. Obviously, in 2,500 feet of water, some 3,000 feet or more of pipe would have to swing free in the water between the surface and the bottom. Supporting this long span by surface craft would be next to impossible—especially in deeper water, say 10,000



THREE POSSIBLE ROUTES for a natural gas line from Algeria to France. Via Gibraltar would be unnecessarily long, must span swift currents of Straits of Gibraltar and would require a great deal of pipelining across difficult terrain. Mostagenem-to-Cartagena route is more direct, but would require laying a line across 125 miles of water, deepest of which is about 8,900 feet. Route via Italy would be good for Italy, impractical for most of France. (See page 22 for details)

feet deep. So the boiled-down problem was to be able to feed the pipe into a gentle overbend, run it to bottom and have it straighten out in a gentle sag bend.

A compressible buoy offered interesting possibilities. It could provide a high degree of buoyancy at surface, then as the pipe moved into an overbend toward bottom, it would progressively lose weight. The over-all effect would be as though one end of the pipe were to gradually and progressively become heavier, smoothly sinking to bottom.

The French pipeliners developed such a buoy. They called it a "breathing buoy". Outwardly, it appears to be an ordinary spherical steel buoy. It is just that—with two exceptions. There are holes in the bottom and it has a rubber and nylon bladder which is pressured with air. As this buoy descends into the sea, the water enters the holes and progressively compresses the bladder. The smaller the bladder gets, the less buoyancy. Conversely, as the buoy ascends, the air pressure in the bladder forces water from the buoy, increasing the buoyancy. The control of the over bend and sag bend which the buoy exercises is a function of the pressure in the bladder.

For towing out to sea, the pipe was suspended some 15 feet below the surface, and the only visible floatation equipment was the breathing buoys spaced 500 feet apart along the length of the tow. On the day of this demonstration, the pipe was towed about 50 feet beneath the surface.

LAYING THE PIPE AT SEA

The convoy towing the "weightless" pipe arrived at the rendezvous area on schedule. A short time after, the converted submarine net tender *La Tarentule* maneuvered along side the *Jean Amedee* and attached its heavy anchor to the shoreward end of the submerged pipe. The time was 9:29 a.m. when this move was completed and the laying operations had commenced.

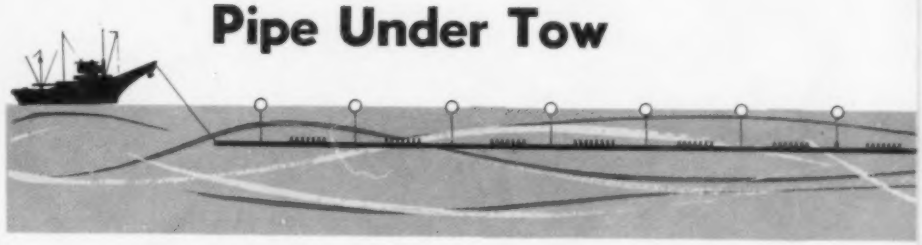
Actually the "breathing buoys" laid the pipe line; but their action had to be triggered by weighting down one end of the pipe. In this case, the plan called for one end of the pipe to be dragged to bottom by the anchor of *La Tarentule*. This would trigger the breathing buoys and the remainder of the pipe would glide to bottom in a long gentle "S" curve as the buoys progressively lost buoyancy as they descended.

La Tarentule announced at 9:49 a.m. that she was slacking off her anchor, starting at a rate of 0.35 meters (14 inches) per second. Three minutes later the first of the red breathing buoys sank beneath the waves, and the pipe had started on its long smooth plunge to bottom—a half-mile away.

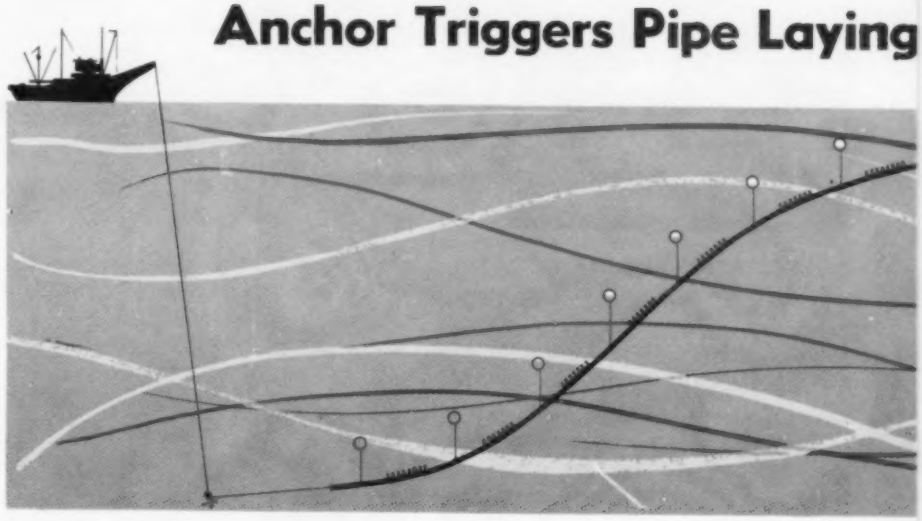
While this was going on, the *L 'Utile,* assisted by a light tug, the *Jean Pierre,* kept a 1.3-ton pull on the opposite end of the pipe. The purpose was to keep the pipe from bending too sharply as it followed the anchor to bottom. Engineers had cal-

How the Pipe Was L

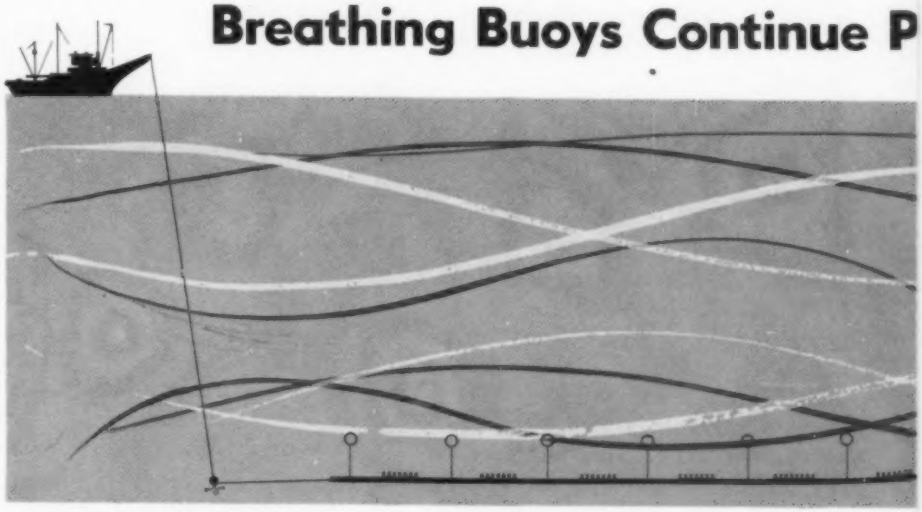
Pipe Under Tow



Anchor Triggers Pipe Laying



Breathing Buoys Continue P



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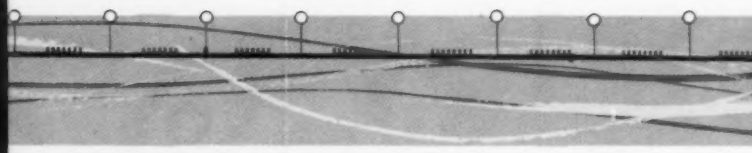
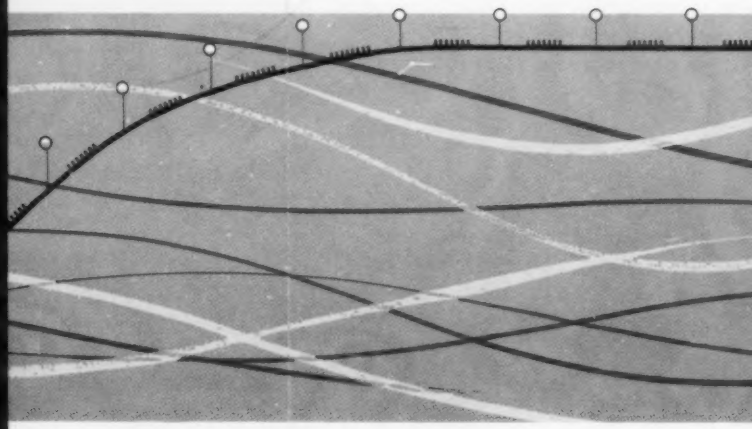
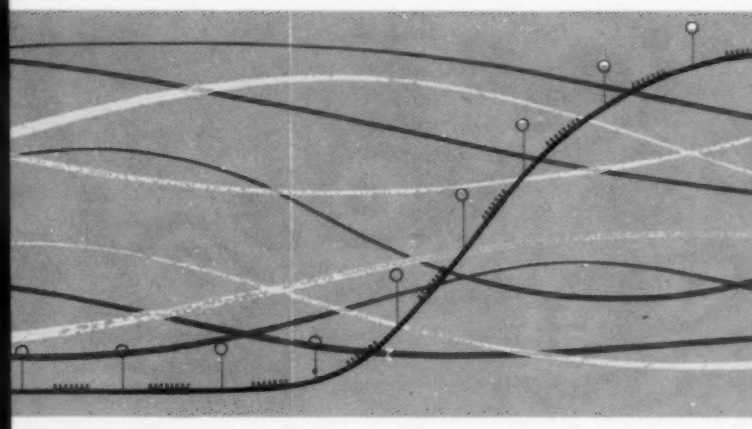


Pipe Laying



Continue Pipe Laying



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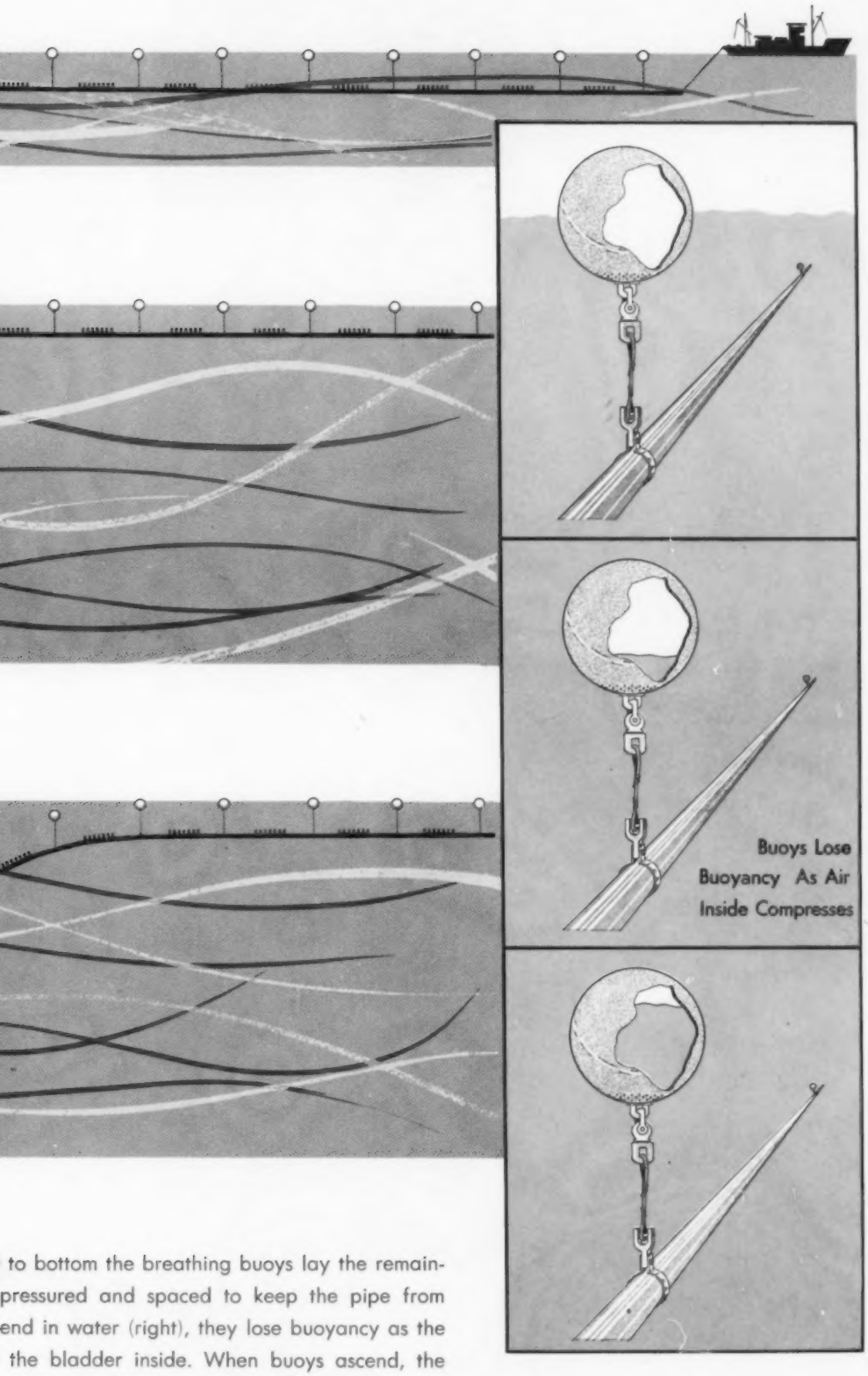
WHEN ONE END IS WEIGHTED to bottom
der of the line. They are sized, pressured
buckling. As breathing buoys descend in wat
pressure of the water compresses the bladd
action is reversed. These buoys are the secret
lining. They enable pipeliners to lay pipe wi



to bottom the breathing buoys lay the remain-
pressured and spaced to keep the pipe from
end in water (right), they lose buoyancy as the
the bladder inside. When buoys ascend, the
e the secret of this method of deep water pipe-
ay pipe without a great deal of equipment.

Staff drawing by Gary Dunham

culated that the minimum bending radius was to be 100 meters or 328 feet.

At 10:41 a.m.—just 52 minutes after commencing lowering operations —*La Tarentule* announced that her anchor had reached bottom and that the ninth of the breathing buoys spaced along the pipe had submerged. This meant that for the time being, the *La Tarentule's* work was done; it was up to the breathing buoys to lay the pipe on bottom in a controlled movement.

As the pipe continued to glide to bottom, it did so under the watchful eye of a hydrographic ship, the *Grand Du*. This experimental ship belonging to Electricite de France was the converted tuna boat which had made the oceanographic studies of France's tidal generating plant at La Rance. This ship was equipped with radar, currentographs, ultrasonic depth finders, echo-sounding equipment and other scientific aids. **As the pipe settled, its configuration was plotted, and when 1,300 meters or about 4,300 feet had been stretched out in the mud, the pipe laying operation was called to a halt.**

Pipe Stuck in Mud. At 12:32 p.m. orders were issued to *L'Utile and La Tarentule* to start pipe recovery operations. At this time, the dynamometer on board *L'Utile* was indicating 1.5 tons. This was the force required to hold the pipe which was suspended between the surface of the water and the bottom in a long "S" curve well in excess of the minimum bending radius.

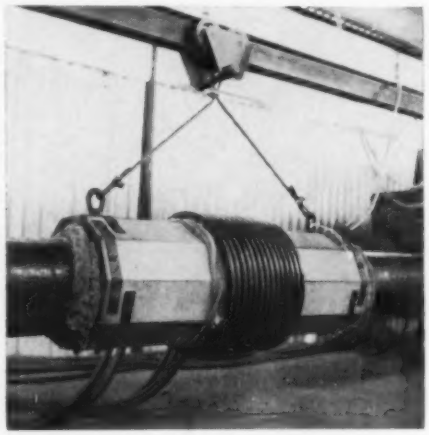
Upon receiving its orders, *L'Utile* "dug in" and increased the pull first to 2-tons then to 3-tons. When the pipe failed to budge at 3.5-tons, the pipeliners knew the pipe was stuck in the mud.

Meanwhile, at the opposite end of the pipe, *La Tarentule* was recovering its anchor and along with it, one end of the pipe. As the pipe rose, the breathing buoys, started making a material contribution to the pipe recovery operation. For as they lifted, sea water pressure against their bladders became progressively less and less and the buoyancy increased.

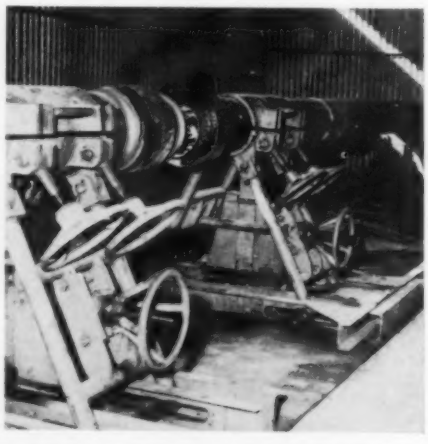
The *La Tarentule* surfaced her anchor at 2.23 p.m. and continued to hold a strain on the pipe. At the opposite end, with *L'Utile* pulling 4.5-

◀ *Please fold out*

PIPE IS WELDED up in 250-meter lengths (820 feet) and each weld of the 8⅝-inch, 0.433 wt chrome, nickel, molybdenum pipe is X-rayed.



EACH WELD is heat treated. Control console handles two heat-treating operations at once. Temperature is elevated to 1155° F, held there for 30 minutes, then gradually cooled to 575° F over two hours.



SCREWING MACHINE joins the new type Stecta connectors. The 820-foot sections are made up with torque of 4,300 foot-pounds.

tons, the pipe came unstuck; and at 3:05 p.m. the pipe recovery operation was completed.

The flotilla started its return voyage to the Bay of Mostaganem moorings.

Meaning of the Successful Operation. The Gaz de France pipeliners and officials were jubilant over the success of the day's operations—primarily because they had developed their laying technique to such an extent that they were willing to go out on a limb by inviting top idustrial officials to travel great distances to watch the operation. Failure under such circumstances would have been embarrassing to say the least.

After witnessing the tests, M. Jeanneney, Minister of Industry, climbed right out on the limb with his pipeliners. He said, "The tests which already proved to be satisfactory will be carried on. An important fact to underline: Problems created by the passage (of a gas line) through the Mediterranean can be considered solved, and this shows the success of genuine French techniques, unsurpassed the world over." He went on to point out that the day of the crossing was now in the hands of the diplomats.

Technical Meaning. At this point, the Gaz de France pipeliners had a meeting to summarize what they had learned from almost one year of experimentation. Here are some of these findings:

1. The method of pipe laying was well-conceived and sound. Depths could be extended with good chance of success.

2. One of the advantages of the method was that in case of sudden storm or squall, the pipe could be lowered to bottom, retrieved later for continued operation.

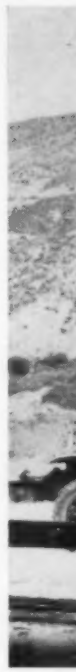
3. The X-95 pipe developed by French scientists was even better than first anticipated.

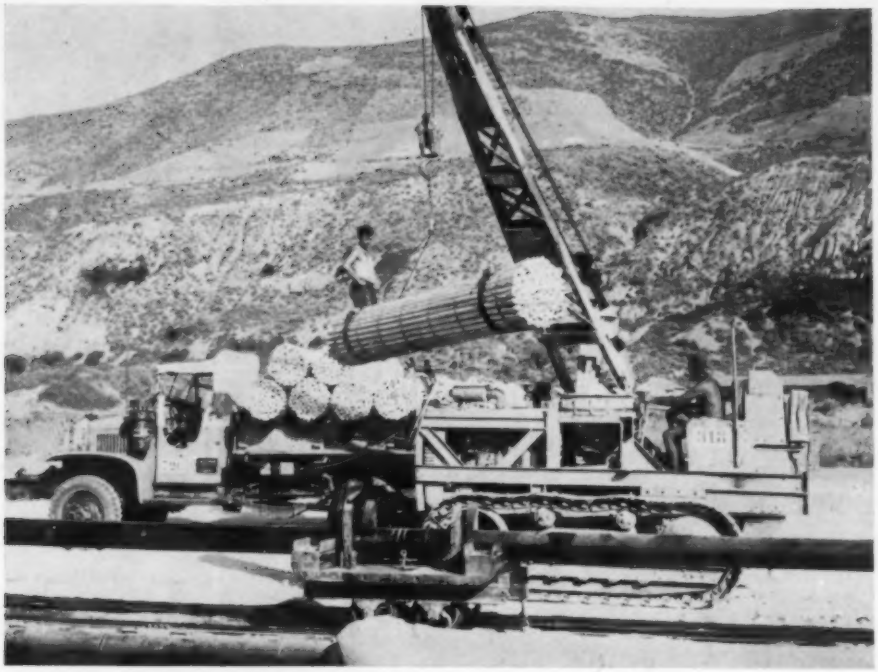
4. Testing should be continued; although, there was little doubt that the techinque was sufficiently advanced to lay small diameter lines across the Mediterranean at reasonable cost.

BACKGROUND OF PROJECT

Before we go into the details of the deep-water pipelining methods, let's take a look at the background of this project.

An enormous gas field was discovered in November 1956 in the Sahara at Hassi R'Mel in central Algeria.





POLYSTYRENE BUNDLE BUOYS are attached to the pipe. These floats will withstand great pressures and wear and tear of offshore pipe line operations.

Engineers have since estimated that this single field contains 35 to 70 trillion cubic feet of gas! One way of expressing the size of this gas reserve is to say that it can supply a large gas system delivering 1 billion cubic feet of gas per day for a period of 96 to 192 years! Another way, is to say that the gas in place is the equivalent of ⅛th to ¼th the total reserves in the United States today.

A vast market in western Europe is waiting to be served. Economists estimate that most of the free countries will double their energy requirements by 1975 and the trend is spiralling sharply upward at this time. Little wonder the possibilities of laying gas lines from Algeria to the mainland of Europe captured the imaginations of leaders in the gas industry all over the world. As pipe line systems go, the distance is not great. It's about 1,100 miles airline distance from the Hassi R'Mel field to Paris, for instance.

The one big obstacle—aside from political barriers—has been the Mediterranean Sea—and the challenge of crossing such a body of water is enough to stir the blood of any pipeliner. One such pipeliner who responded to this challenge was M. Delaruelle, general superintendent and technical adviser to the management of Gaz de France.

Joint Task Force. He reasoned that if pipe could be developed which would withstand the great depths of water, French pipeliners, given the opportunity, could devise a means of laying that pipe economically. As a result, a joint task force sponsored by Gaz de France and Electricite de France was organized to work on the project under Delaruelle's supervision.

Three unknowns confronted the task group. They were:

1. **Finding the best route**—This involved a detailed study of the currents, depths, contours and bottoms consistencies of the Mediterranean as well as an economic appraisal of the entire project.
2. **Developing a pipe** to withstand the great external pressure. If the crossing was to be anywhere except at the Straits of Gibraltar, the external sea bottom pressure could likely be as high as 4,000 psi.
3. **Developing a new deep-water pipe laying technique.** The deepest pipelining in the world thus far has been in the United States and none of the lines exceed a few hundred feet in depth.

The joint task group attacked the problems in the order given above.

FINDING THE BEST ROUTE

There are three logical routes for the Africa to Europe gas lines. They are:

The Gibraltar Route. This is the most obvious route. The distance across the Straits of Gibraltar measures 7¾ to 23¾ miles; the most practical locations for pipe line crossings measure 12 to 18 miles. Compared with the other two crossing routes, the water is relatively shallow, running about 1,100 feet deep. But the currents are strong, unpredictable and, to a degree, uncharted. They could make pipelining difficult, for the surface current flows easterly and the underwater current usually flows westerly. Velocities sometimes reach 5 knots. In close to shore, the currents are highly variable. Observers have reported that 2½-knot currents running three miles out from shore have completely reversed their directions within an hour's time.

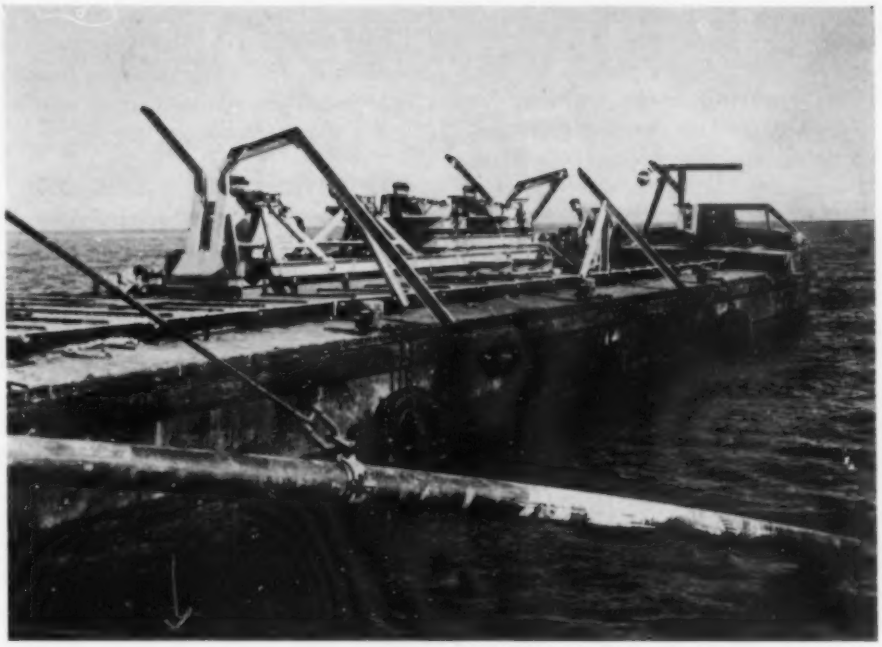
Aside from the water difficulties, there is another disadvantage to crossing the Mediterranean at Gibraltar. Take a look at the map and you'll see that this route is several hundred miles longer than necessary. Moreover, it crosses more miles of difficult mountainous terrain.

The Mostaganem to Cartagena, Spain Route. From the outset this seemed to be the most logical route. It is most direct, and involves a minimum amount of mountainous terrain. Yet it requires crossing 125 miles of sea between the Bay of Mostaganem and Cartagena, Spain.

An oceanographic survey was started in February 1959 to study out the details of this route. Here are the important findings: (1) The deepest water along the route was about 2,700 meters or 8,856 feet. (2) Currents were negligible, running in the order of one-half knot. (3) The slopes of the continental shelves did not exceed 20 percent—an acceptable value for pipelining. (4) The bottom along the route was composed of soft mud—padding for an otherwise rocky surface.

The Cap Bon—Sicily Route. This route called for a line to be laid from Hassi R'Mel to Cap Bon, Tunisia, then 77 miles across the Mediterranean to Marsala, Sicily, then on to Italy. This route will likely prove feasible as a source of gas for Sicily and Italy; but it will not likely prove to be the best possible route for a gas supply for France.

The most favored route seemingly is the Mostaganem-Cartagena route, and the experimental work which followed the oceanographic survey has been based on the assumption that this would be the one selected for the crossing. Recently, a 24-inch line was constructed from Hassi R'Mel to a point near the coast along this route.



LIGHT BARGE MAKES CONNECTION AT SEA. On board is a pipe screwing machine similar to the one on land.

DEVELOPING THE PIPE

Specifications for the pipe to be developed for the crossing were arbitrarily set at 4,300 psi for external pressure and 5,700 psi for internal working pressure. There are several advantages in using high internal pressures. First, it enables the system to deliver a high volume of gas with a small line. Second, in this case, it will minimize the differential pressure between the inside and the outside of the pipe.

While the French haven't announced details of the crossing, they have opened the door to interesting conjectures. For instance, it is possible to operate an 8-inch line at pressures which will deliver between 80 and 100 MMcf of gas per day. If the first 30 miles or so of the line will withstand high internal pressures, the remainder of the crossing will not have a great differential between internal and external pressures. Of course, the external pressure in 8,800 feet of water will be almost 4,000 psi, and it makes sense to have an approximately equal internal pressure—perhaps, running "north" and then "south" of 4,000 psi. One factor contributing to this plan of operation is the weight of the gas itself. As the pipe drops from sea level to deep water, the pressure pick up from this weight could run about 750 psi. On the opposite shore, as it climbs to sea level, the weight of the gas acts as a static head, causing the internal pressure to drop sharply, coinciding somewhat with the rapid decrease in external pressure.

THIS PLASTIC CONTAINER filled with gasoline to provide buoyancy in water was effective but troublesome. It had to be supported by plank "crutches" which were removed after pipe entered the water. Net remained to buoy the pipe.

X-95 Pipe. A chrome, molybdenum, nickel alloy pipe known as X-95 was developed by the French by June 1959. The 8⅝-inch 0.433 wt pipe displayed the high elastic limit and great tensile strength that the scientists wanted. This pipe is fully capable of withstanding either the external or internal pressure originally specified. In fact, after almost two years, the French pipeliners are satisfied that

the pipe is far better than originally thought.

Heat treating after welding was necessary, and arrangements were made to carry out this task at the launchways. After each weld, an induction heater carried the temperature of the weld area to 1155° F and held it there for 30 minutes. Then the temperature was gradually reduced to 575° F over a two-hour period. A programed temperature regulator was installed for controlling the cycle of heat treating for two welds simultaneously.

DEVELOPING THE PIPE LAYING METHOD

Experimental work in a hydraulics laboratory at Chatou was commenced in September 1959. The objective was to devise a new method of deep water pipelining which could be carried out at reasonable cost.

Here engineers first conceived the method described, checked the idea mathematically and then constructed scale models to verify the calculations. They were agreeably surprised to find that the velocity of pipe fall, trajectory, radius of curvature and reactions at the buoys, etc. agreed with their calculations. As a result, they wasted little time in moving operations to the Djebel Diss naval base in northern Algeria where full-scale field tests were to be made.

The over-all pipe laying plan devised by French engineers is similar in many respects to methods used in the Gulf of Mexico on a number of occasions. The pipe is welded up into long sections on shore, and after buoys are attached to it, launched into the sea and towed to its position in the line. (Because of the high pressures involved at great depths, ordinary buoys cannot be used. More about this later.) At the end of each long section, the French plan to have a new screw-type joint, called "Stecta." And as each section reaches its position in the pipe line, it will be screwed on to the previous section, and then the breathing buoys will take over and lay the line on bottom. During this operation, tugs will keep a tension on the pipe to aid in preventing sharp bends and buckling.

The entire operation is to be carried out with relatively small seagoing vessels. The tie-ins will be made on a special barge, and the ends of the pipe handled by a conventional crane. So long as the breathing buoys remain attached to the pipe, it will be possible to lower the pipe to bottom and discontinue operations during rough weather.

OPERATIONS AT DJEBEL DISS

The naval base at Djebel Diss in northern Algeria was re-activated in January 1960 by Gaz de France pipeliners enthused and anxious to try a new method of pipe laying. In no time at all, the base was converted to a pipe yard and launchways.

The first step in this operation was to weld the high chemistry pipe into 250 meter (820-foot) sections. Each weld was X-rayed and heat-treated as described above.

New Screw-Type Joint. The 820-foot sections of pipe were joined together with a new screw-type joint which the French call "Stecta joint". This is evidently a lens-type joint similar to the ones used on extremely high-pressure piping. The joints are made up by a machine to a torque of 4,300-foot-pounds, which is sufficient to wedge the conical rings against the seats.

Buoys. Laying pipe at unprecedented depths called for something other than conventional buoys. Several new ideas were tested and found wanting.

For instance, spherical and drum-type buoys pressured with air, simply crushed and exploded at the great water depths. An unusual type buoy which was capable of supporting the pipe at virtually any depth, but otherwise very troublesome was the gasoline-filled plastic and nylon bag. The buoy resembled an over sized pillow, and it had to be supported by wooden "crutches" until it was launched. It was attached to the pipe with netting. Drums of gasoline also provide good buoyancy and having liquid inside, they are able to resist the crushing force of the sea.

But the best buoy for deep water seems to be one composed of polystyrene "sticks" about 6 or 7 feet long. They are bundled together as shown in the illustrations. They have demonstrated an excellent resistance against high pressure water.

The one disadvantage is the rather high cost.

The breathing buoys which were described earlier are pressured from 50 to 100 psi. In actual pipe laying, the French have found that the size of the buoys and the pressure inside their bladders has a definite effect on the depth to which pipe can be laid. This was discovered in one of the early pipe laying experiments, when only a few meters of the over-buoyed pipe ever reached bottom.

Several times during the experimental program, the compressible buoys were re-worked.

Launching the Pipe. Prior to launching, the pipe is mounted on conventional narrow gage mine carts and as the pipe approaches the water, the "carriages" drop off and the pipe continues into the water with its wooden supports sliding on the rails. When the buoys take over and lift the pipe, the supports fall from under the pipe.

Three tractors are used to push the pipe as it is launched in 1,000-meter, (3,280-foot) sections, and at sea a tug maintains a steady pull that moves it slowly into the water.

Making Connections at Sea. A pipe screwing machine, similar to the one used on land, was mounted on a barge to make the connections at sea. A large derrick crane barge lifts the ends of the pipe onto the barge where it must be forcefully lined up and the joint screwed together as on land. Afterwards, the pipe is re-fitted with polystyrene buoys which were temporarily removed during this operation.

Additional Experimental Work. Long sections of pipe—one 15,500 feet long—have been successfully handled at sea even in fairly rough water, and the French pipeliners are venturing into deeper and deeper water with their experimental sections of pipe.

Of course, other factors, particularly political ones, will have a greater effect on the feasibility of laying a pipe line across the Mediterranean than will the technical difficulties in the future.

But in any event, the French pipeliners have shown a wonderful ingenuity in devising this new method of offshore pipe laying, and if the politicians and financiers can only display an equal amount of ingenuity, we may well soon see the first gas line laid across the Mediterranean!

ACKNOWLEDGMENT

Technical data and photographs were supplied by Gaz de France. Help with translations of French reports came from the French Consulate of Houston.

Trunkline's New Road Boring Technique

By using an oil-water emulsion between the casing and the soil, the company was able to bore a hole for 34-inch casing through 320 feet of sandy clay which had resisted conventional road-boring methods

By V. R. Kincheloe
Construction Superintendent
Trunkline Gas Co., Houston

As the highways get wider, road boring jobs get more difficult.

Recently, Trunkline Gas Company had the problem of installing a 34-inch casing beneath a 425-foot-wide super-highway in Mississippi. Using conventional methods, the contractor had attempted to bore 320 feet through the sticky sandy clay. He stuck the casing after penetrating only 210 feet.

To solve this problem and similar ones expected in the future, Trunkline devised a new road tunneling technique. On this particular job it proved highly effective. The casing job was completed in 12 hours and 50 minutes, and welding consumed most of the time.

The new method is based in part on oil well drilling techniques.

Review of casing problem. The new super highways and turnpikes under construction throughout the United States are creating plenty of problems for the pipeliner. Often, existing crossings have to be lowered and cased. And new lines have to be tunneled beneath these divided, limited-access roads which have right-of-way widths of several hundred feet. To put a pipe line under a road of such size requires a long and difficult bore to install the casing.

But the super highways are not the only source of trouble in this regard. The trend seems to be more and more toward the casing of large irrigation canals. If this trend continues, (and it seems likely) it is reasonable to assume that we will have more and more bores of several hundred feet.

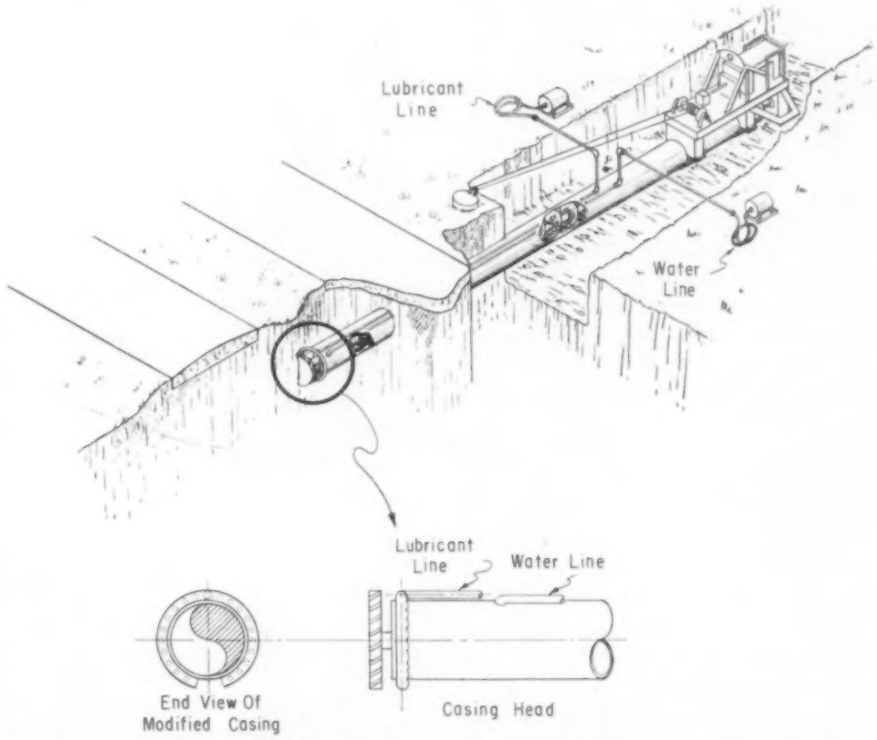
Long bores have been made in the past without incident, and many will be made without incident in the future. However, under certain conditions, some of the long ones can be very troublesome.

Case history of a difficult job. One such troublesome job was encountered on Trunkline's 30-inch loop line near Senatobia, Miss. Grayco Constructors of Austin, Texas, were the contractors.

Crossing Length. The permit given Trunkline for this crossing of the new Interstate Highway 55 required that it be cased from right-of-way to right-of-way, a total casing length of 425 feet. The crossing was located where the road bed had approximately 15 feet of fill, and there was an eight foot deep borrow ditch that had been cut at the toe of the fill. The actual bore to be made was 320 feet.

Failure of First Crossing Attempt. Ordinarily the boring of these horizontal holes for casing under highways, railroads, or canals is a routine operation, but Grayco's first attempt failed after the 34-inch casing became stuck after having 210 feet of it installed. This was because the formation through which the crossing was to be made was a sandy clay that became extremely sticky when wetted. The use of water was prohibited other than to aid the removal of the cuttings through the casing.

New Idea. It was then decided to introduce a fluid or a type of lubri-



HOW THE NEW METHOD WORKS. Two 1-inch lines are atop the 34-inch casing. One supplies water to the inside of the pipe where the auger removes cuttings from the oversized cutter head in front of the pipe. The second one-inch line supplies a ring welded around the forward end of the pipe with an emulsion. This emulsion fills the space between the outside of the pipe and the soil. This fluid keeps the soil from caving, prevents clay in the soil from swelling and reduces friction between the pipe and soil.

cant to reduce the friction between the pipe and the sandy clay as a possible solution to the problem.

Mud Company Consulted. Dr. George R. Gray of Baroid Division of National Lead Company was consulted, and Trunkline placed several requirements on the properties of the fluid. (1) The lubricant must not soften the coal tar coating on the casing; (2) It must not cause the clay to swell; (3) It must be pumped through a one-inch pipe even after remaining undisturbed for several hours; (4) Pumping would be interrupted while additional sections of casing were welded on to make it continuous.

Composition of the Behind-the-Casing Fluid. The formulation for the behind-the-casing fluid was developed in the mud company's laboratory. The final composition contained the following ingredients per barrel of fluid:

0.92	barrel of water
3	lbs. of modified guar gum (Lo Loss)
3	lbs. of calcium chloride
0.07	barrel of diesel oil
0.007	barrel of a combination surfactant and emulsifier (Trimulso)

The modified guar gum served as a thickener that would not develop a strong gel structure after standing undisturbed for a long time. The calcium chloride provided calcium ions to prevent the swelling of clay, and the surfactant and emulsifier produced a stable emulsion of diesel oil in water.

How the Drilling Fluid Was Prepared. The simplest method of preparation was to add the guar gum and emulsifier to the diesel oil, then stir this suspension into the water containing the dissolved calcium chloride. The finished product had the consistency of thin mayonnaise.

Field Trial. On Feb. 11, 1961, preparations were completed for using the lubricant fluid on the second attempt to make the crossing under Interstate Highway 55.

To carry the lubricant into the hole and inject it in the space between the 34-inch casing and the soil, a one-inch pipe was welded to the 34-inch casing to form a ring extending around most of the circumference of the forward end of the casing. The bottom 18 inches of the circumference of the casing was skipped. The ends of the one-inch pipe were closed. Holes (¼ inch) were drilled into the one-inch "ring" pipe to allow the emulsion to flow out along the surface of the casing. An additional one-inch line was used to supply water to the inside of the casing to help in the removal of the cutting by the auger. Both these one-inch lines had previously been coated, and after the bore was made, they were to be capped and left in place.

An oil-well cementing truck was on hand to fill the 210 feet of stuck casing with cement. It was also used to mix the emulsion and pump it into the new casing as it was run beneath the road. The low pressure and small volume fluid requirements could have been handled by any small pump. An Athey wagon that had been converted to a 4,000-gallon water tank was used as the "mud pit." The modified guar gum and surfactant-emulsifier were added to diesel oil in a "pup tank" and were then blended into the water containing the calcium chloride by circulating through the pumps. After the first batch (about 90 barrels) had been prepared, boring was begun. Thereafter, the emulsion was prepared during periods of shutdown in such amounts as could be accommodated in the water tank.

Pumping Rate of Fluid. When boring was begun, at 2:40 p.m., an attempt was made to pump the emulsion in at such rate as to furnish one-half barrel per foot of advance of the pipe. Ninety feet of casing were introduced in 50 minutes while pumping 35 barrels of emulsion. Pumping was discontinued for 2 hours and 20 minutes while another 120-foot joint of casing was welded to the first and connections were changed. Boring of the next 120 feet required 2 hours and 5 minutes (including 15 minutes changing connections) and 65 barrels of emulsion were pumped into the annulus between the casing and soil. After a shutdown of pumping for 4 hours while a 110-foot joint of casing was welded to the second, 70 barrels of emulsion were pumped while the pipe was advanced 104 feet in 2 hours and 35 minutes (including 35 minutes changing connections). Pumping was then stopped, and after changing connections (55 minutes) boring was continued for 5 minutes (6 feet) until the bit and pipe broke through on the far side of the roadway.

In summary, 320 feet of hole was bored in 4 hours and 45 minutes (elapsed time 12 hours and 50 minutes) while 170 barrels of emulsion were pumped into the annulus.

Materials added to water in the preparation of about 8,000 gallons of emulsion were: modified guar gum, 600 lb.; calcium chloride, 600 lb.; diesel oil, 700 lb.; surfactant and emulsifier, 60 gallons.

Final Details. After the casing was through, the auger removed and the casing swabbed thoroughly, the perforated one-inch ring and the end of the casing was cut off, ends of the one-inch water line and the lubricant line were sealed and then left in place.

From this it is obvious that should a contractor have any reason to believe that adverse conditions would be encountered on a crossing, he could then weld his lubricant ring around the end of the casing and also take his one-inch lubricant supply line in with the casing. If the crossing is routine, the ring can be cut off and the one-inch pipe left in place. When trouble occurs or if conditions require, the one-inch supply line is available to connect to and lubricate the casing. The cost of a few hundred feet of one-inch pipe is very cheap insurance to realize the successful completion of a difficult crossing.

—The End

About the Author

Virgil R. Kincheloe has served as the construction superintendent for Trunkline Gas Company, Houston, since 1954. His pipelining career got its start in 1936 when he joined C. S. Foreman, pipe line contractor where he rose to the position of pipe line superintendent. In 1948, Kincheloe joined Panhandle Eastern Pipe Line Company, Kansas City, and when its subsidiary, Trunkline Gas, was formed, he moved to Houston as chief inspector in the Engineering Department.

Self-Supporting Arch Spans 150-Foot Canal

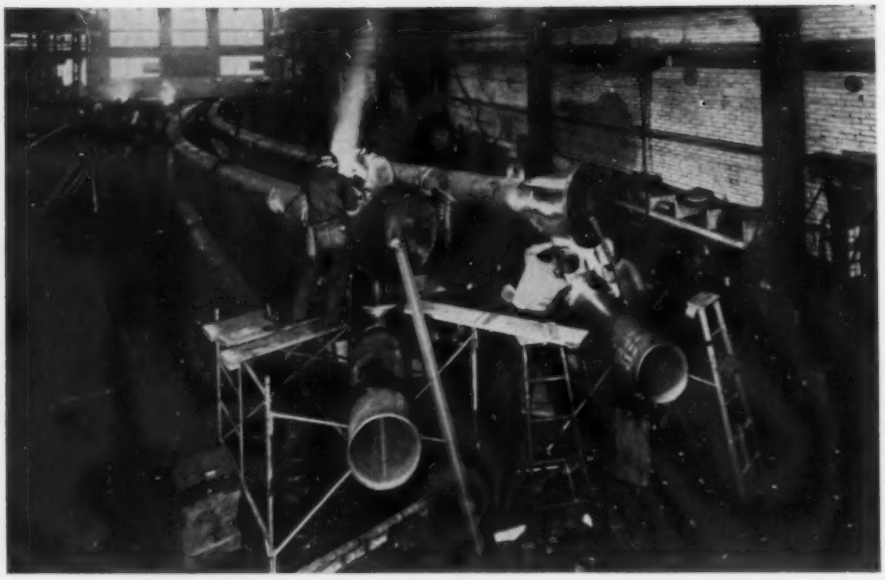
This span, the largest of its kind, was erected in 12 hours

By William H. Donnelly, Development Engineer, and **Edward V. McMullin,** Engineer, Laclede Gas Company, St. Louis

A SELF-SUPPORTING pipe arch of two 16-inch lines was erected across Coldwater Creek just north of St. Louis in a matter of 12 hours. The two sections of the 150-foot span (which measured 160 feet along the arch) were shop-fabricated, hauled to the site where foundations anchored in bed rock had previously been poured. The twin base plates at the lower end of each section were fitted over circles of anchor bolts; and then, with each section tangentially loaded to simulate final compressive loads of the structure, the tie-in was made.

EXPANSION PROJECT

The erection of this arch was part of an expansion project aimed at increasing Laclede Gas Company's supply of gas for the St. Louis area by



FROM SHOP TO COMPLETION IN SINGLE DAY. The arch was shop-fabricated in Midwest Piping Company's St. Louis shops (left). The pipe is 16-inch OD with 0.375 wall thickness. It is API 5 LX 42 and gets its yield from its chemical composition rather than from cold working. The structure was hauled from the shop to the crossing site (right) and erected in a single day. The two 16-inch lines arch across the 150-foot wide canal.

some 200 MMcfd. Engineering work started last December. A high-pressure transmission line was to be laid to connect with a new line to be laid by Mississippi River Transmission Corp. from a connection with Trunkline Gas Co. at Johnsonville, Ill., to a point on the west bank of the Mississippi River, about two miles north of the city limits of St. Louis.

Preliminary designs were completed, and Laclede decided to build 11 miles of 20-inch API 5 LX 52 pipe line in 0.312 and 0.344 wall thicknesses from a new take-point station that was to be erected on the bank of the Mississippi to connect with Laclede's Lange underground storage field at Florissant, Mo. The design of 55,000 feet of this line was fairly routine. But a 150-foot section near the center of the project turned out to be quite a problem.

A portion of the line in the preliminary design was laid out along U.S. highways 67 and 140. Just south of the latter is a large drainage canal known as Coldwater Creek, which empties directly into the Missouri River. It was determined in the preliminary survey that at the point where Coldwater Creek should be crossed, the channel had been carved out of solid limestone rock.

The first solution was to approach the Highway Department for permission to erect the line on the existing highway bridge. This proved impractical. The highway at this point was due for ultimate relocation. The transmission line would undoubtedly have to be moved also.

The second approach, also fairly obvious, was to install piers across the creek on one side of the highway bridge. A discussion with the Metropolitan Sewer District ruled this out. The channel is also scheduled for future re-working and widening.

The Third Possible Solution. Some two years earlier, Laclede's Engineering Department had done some preliminary work on an arch type crossing of a small creek for a propane line. But at that time, the project was abandoned because the line was rerouted.

At this point, the Engineering Department decided to re-examine this arch-type design to determine if such a span could be erected which would clear the entire drainage canal. Preliminary calculations indicated that if an arch type construction were used, this channel might be spanned by a single 20-foot pipe line arch. However, some doubts arose in the minds of Laclede engineers as to whether or not the assumptions used in the design were good in theory. At this point a consultant, Dr. R. E. Brielmeyer of Washington University, was contacted by Laclede's engineers and the entire stress design and its assumptions was throughly discussed. It was his feeling that this design was entirely practical.

These preliminary calculations for a single span of 20-inch pipe called for the use of an arch type structure having a vertical rise of 20 feet and having fixed ends. Pipe was to be API 5LX52 with a 0.500 wall. But such pipe was not available, and it was decided to explore the use of a double line. This would allow a reduction in diameter and a reduction in wall weight and have the added advantage of giving increased lateral stability. This design was resolved to be a double arch consisting of twin lines of 16-inch API 5LX42 pipe having a wall weight of 0.375.

Economic Comparisons. At this point it was decided to make an economic comparison of fabricating and erecting an arch, versus the other alternatives such as blasting a ditch under the canal, or erecting a structure over the canal piece by piece. The economic studies indicated that a single piece construction might, in the long run, be far more economical, particularly if the erection could be accomplished in a short time.

Practical Considerations. Cranes which could construct the arch in one piece were not available. The 150-foot span would weigh about 13 tons and it would have to be erected from a bridge 55 feet distant from the centerline of the crossing. However, two 60-ton cranes with 85-foot booms were available, and calculations showed that each crane could handle one-half of the arch section. There-

ALL IN A DAY'S WORK. One-half of arch goes into air (left). They fitted the bolt circles perfectly, a real tribute to careful engineering and fabrication. End plates are bolted onto foundation (center). In the center is a 16x20-inch swage which connects onto new high-pressure 20-inch gas line. Final tie-in weld (right) was made at dusk. Two sections of arch fitted perfectly, except for slight difficulty with the gap, which at first was zero at top and 3/16 inch at bottom.

fore, the plan was again revised and studied from an economic viewpoint with the erection to be in two halves with only a center weld to be made in the field. This proved to still be cheaper than any of the alternatives.

DESIGN OF THE ARCH

Laclede engineers made a stress analysis of this configuration using the assumptions above and came up with a design for an arch member which was 150 feet and 4 inches base-to-base on the foundation with a vertical rise of 20 feet in a segment of the circle. Under the B31.1.8 Code for a Class C location under hydrostatic test conditions of approximately 1,500 psi and a lateral wind loading of 100 mph, such an arch would have a design factor of safety of better than 4-to-1. On this basis, the stress calculations were completed and drawings made up for an arch to be constructed in two sections, each section to be 80 feet long.

Fabrication. The problem then was to find a fabricator who had the space, equipment and know-how necessary to handle such a large job. Midwest Piping, Division of Crane Company, evidenced interest and after consultation was awarded the contract for fabrication of the arch.

Pipe. The next problem was the procurement of the pipe. The design called for 16-inch 0.375 wall pipe with a minimum yield of at least 42,000 psi; but because of previous experience with field welding of high tensile cold worked pipe, it was felt that it would be better in this case to procure a pipe that had the desired minimum yield because of its chemical constituents rather than cold expansion. The basis in the theory of design in going from the 0.344 wall which was being used in the 5LX52 line pipe to the 0.375 wall was in order to drop the working hoop stress below 50 percent of the specified minimum yield so that external welding of attachments would be permitted under the ASA B31.1 Piping Code.

Shop Work. Upon receipt of the 16-inch pipe, Midwest proceeded immediately, even before the final design was completed, to hot-bend 40-foot lengths into the segments of a circle having a 150-foot radius. Next came the fabrication of the two 80-foot segments. Here's how it was done. The two pieces were laid in a circular segment on the shop floor and welded together. The 12-inch external struts which were to become the final cross bracing were welded vertically. The second circular segment was laid out and set on top of the 12-inch vertical supports for the final welding. The end connections to the pipe line and the base-supporting flanges (shown in the accompanying photographs) were also a matter which was given a good deal of thought in the design layout.

X-Rays. An added problem to the fabrication and the time requirement was the 100 percent radiography requirements specified by Laclede. Because the pieces were of such length and size that they were not easily handled, it was necessary to perform the radiography in the fabrication area.

Base Flanges. For purposes of resisting wind loading, the design encompassed the idea of leaning the two circular segments together at the center of the arch from a spread footing at the base. This made it necessary to design the base flanges at an angle to the center line of the incoming pipe line connection in three planes. While this increased the difficulty in the lay-out of the concrete foundation, it was felt that this foundation design itself could be made sufficiently flexible to compensate for this.

This, in truth, was accomplished by using the drilling templates to which the base flanges had been drilled in order to grout one set of foundation bolts on each flange into place ahead of time, and to equip the matching base with bolt sleeves into which double end studs could be screwed after the arch was in position and the first base flange lined up. This required extremely careful foundation layout and forming in order to achieve the accuracy necessary to the alignment of the foundation faces. This portion of the job was handled

by Frazier-Davis Construction Co.

Foundations. In order to have fixed ends, it was necessary on the south side to drill out the limestone rock for the footing. On the north side it was necessary to set three 36-inch reinforced piers tied into the bed rock with steel dowels.

Tangential Loading. One of the features of the design which Laclede engineers felt was extremely important was the fact that the pieces should be loaded tangentially when they were picked up by cranes. Thus, during handling and erection of the pieces, loading would be exactly the same as the loading would be on the arch after it was in place and loaded under its own weight. This required a good deal of consultation with the erection sub-contractor, Ben Hur Construction Co., so that a method of rigging could be worked out ahead of time which would assure this tangential loading. This was done and the rigging cables and fittings were all laid out prior to the day of actual erection. The erector preferred originally to pick up the pieces tangentially loaded in the manner described above, however, it proved to be a problem to ship them in a position that would allow this type of handling since the only vehicles available for handling these extreme lengths were pole type trailers. It was decided to weld them with structural external attachments vertically between the truck bolster and trailer and to haul them in this position. There were several reasons for adopting the tangentially loaded type of rigging. The primary reason being that since we were working between a fixed set of foundations already in place we could not afford any movement caused by deflection due to handling the pieces from the center; for example, once the foundation ends had been fixed any deflection would have to be taken up in misalignment in the center connection and this, of course, we could not tolerate.

Because plans called for erection to be completed in one day, the pieces were loaded out of Midwest's shop on the previous day and hauled to the job site and left standing one on either side of the drainage canal overnight. At 8 a.m. the following morning the erection contractor arrived with the previously fabricated rigging and cranes. Previous arrangements had also been made with the State Highway Patrol to block one-half of the highway.

This was necessary because when the cranes were turned 90° to the roadway they partially blocked the travelled portion of the highway. Another obstruction that had to be cleared was a 13,000-volt transmission line. This service was interrupted prior to the actual erection but lines remained in place throughout the erection and, therefore, had to be cleared.

The trailer loading as previously described required the erector to pick the pieces off the trailers on their sides and rotate them in mid-air to the tangential loading position. The north section of the arch was unloaded from the truck and turned in mid-air as previously planned. As soon as the turn was complete it was evident to our engineers that the structure had sufficient rigidity to be handled and manuevered so it was immediately lifted over the adjacent transmission line and the base flanges set and bolted to the foundations.

While this was being done the rigging crew proceeded to the south section, fitted the rigging, and it was picked with the 45 ton crane and also swung into the position. The time required for the actual rigging and fitting for the base flanges, bolting and shimming, was approximately 8 hours from the time the cranes arrived on the site.

Donnelly McMullin

William H. Donnelly, Laclede Gas Company development engineer, attended Northwestern Technological Institute and was graduated with a B.S. in mechanical engineering from Washington University in 1947. He started with Laclede in 1948 and has held the positions of plant engineer, load dispatching engineer, and design engineer. He is a member of the American Gas Association and chairman of the NEC Classification Committee.

Edward V. McMullin is an engineer with Laclede Gas Company. In this position he assisted in the design and construction of the span described in this article. He was graduated from Washington University in 1957 with a B.S. in mechanical engineering. He has been with Laclede since that time.

Welders' Platform. It had been previously decided to erect a platform around the center point on which the welders could stand to make the final weld. This platform was attached and raised in the air and the welders went up to fasten the line up clamps in place to begin the welding procedure.

Line-up. It was at this point we discovered that while the line was aligned perfectly horizontally that vertically the top segment of each of the two sections were butted tight while the bottom gapped approximately 3/16-inch. This proved to be the unfortunate part of our trick of loading it tangentially because at this point anything that we did with either of the two cranes would only raise or lower the segments relatively and what was needed was to apply a vertical force directly so that the gap could be taken up by the addition of shims on the foundation.

Solution. It was decided to bolt both segments tight on the foundations and to pull the line-up clamps tight. Then the crane on the north side was instructed to drop its load and swing to a previously attached cable in the center of the span. There was some discussion about the possibility of tieing the whip line to the center cable and using it for a hoist, but the cranes were so far off to the side that the whip line would have run out of the sheave so this idea was abandoned.

As soon as the crane picked up the load in the center, the line up clamps were refitted, the alignment was made perfectly, and two welders working simultaneously on the same weld proceeded to make the final tie-in. As soon as the weld was complete it was allowed 15 minutes to cool, both cranes were detached, the crossing was completed.

The following day the pipe line was welded to each end and a hydrostatic test was placed on the structure. On April 29, 1961, the line was pressured and placed in operation.

—The End

Dispatching Gas By Pushbutton

THE NEWEST THING in automation in the pipe line industry is The Peoples Natural Gas Company's dispatching system which controls and monitors five major meter and regulating stations in southwestern Pennsylvania. With it, the dispatcher in Pittsburgh can operate a highly complex pipe line system by pushbutton.

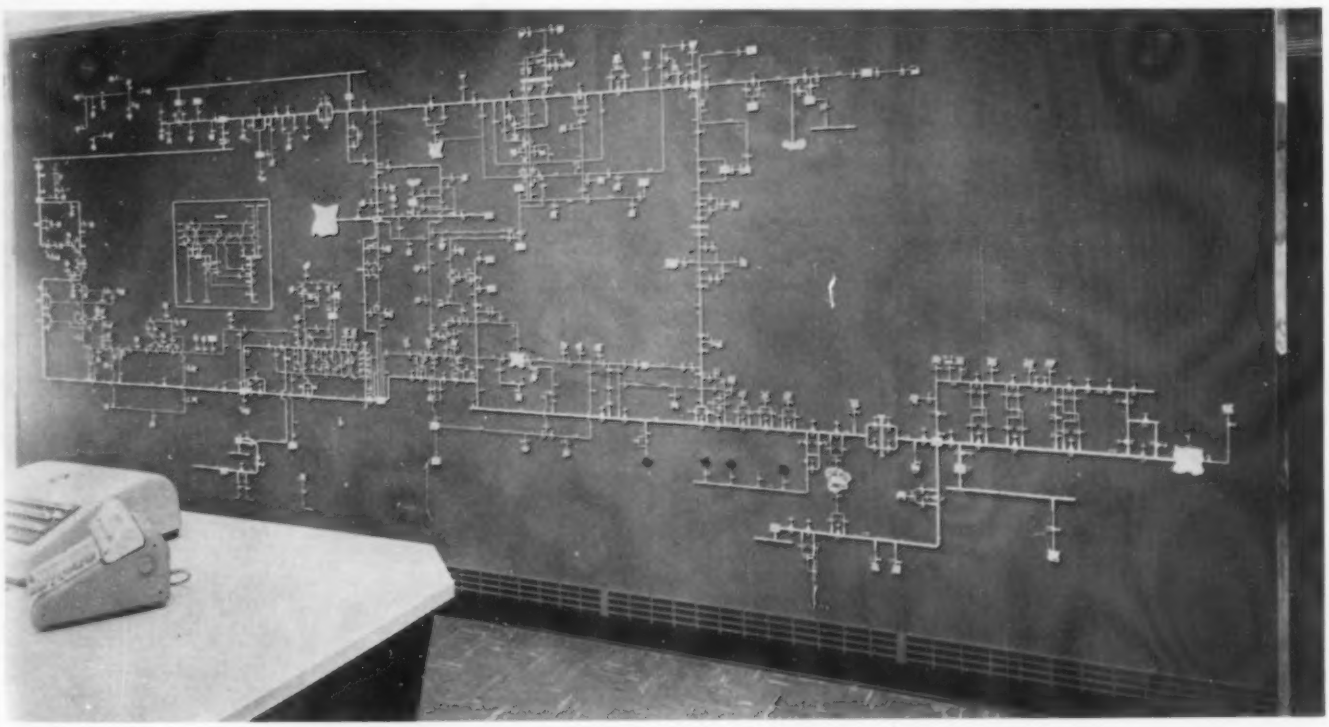
Communications for the system are carried over leased lines; and the instrumentation is primarily based on digital transmission of data. The supervisory phase of the installation is an adaptation of a system designed for the U.S. Air Force in missile testing work.

Peoples Natural is one of the country's oldest major gas companies—it started in 1885—and it has 272,000 customers. In recent years, the company has expanded rapidly, and new pipe lines, compressor stations and metering and regulating facilities have complicated the dispatching problem.

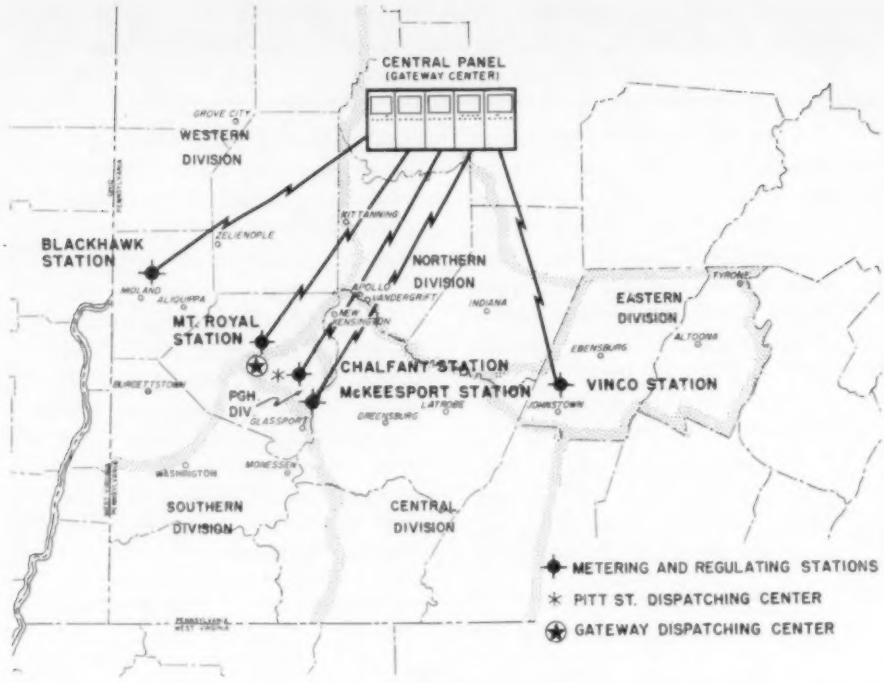
Telemetering and Remote Control Gas Dispatching System Design

By A. F. Kraus, Chief Gas Measurement Engineer
The Peoples Natural Gas Co.

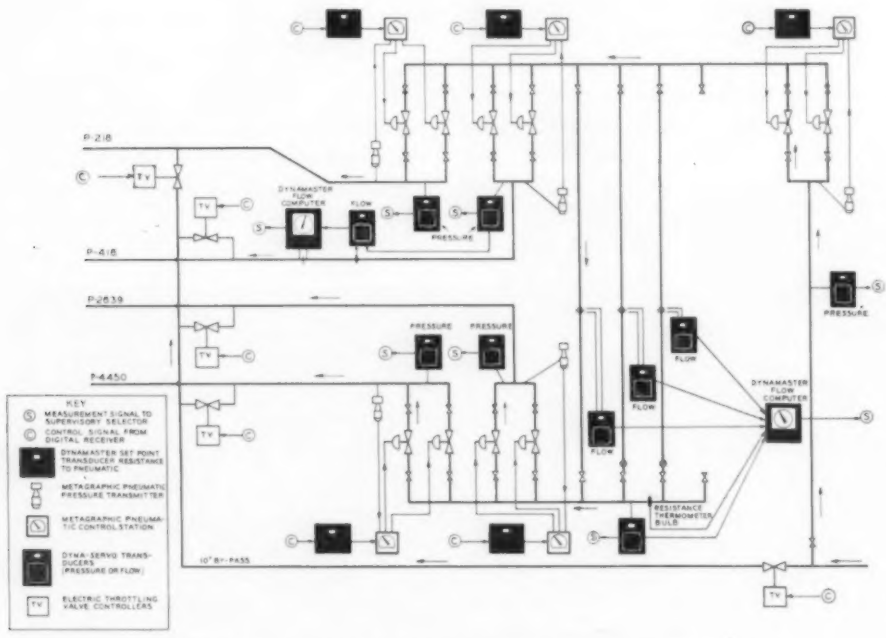
SOME YEARS AGO, Peoples Gas management decided that some form of telemetering flow and pressure information was required in the dispatching system to economically meet the increasing volume requirements of customers. After investigation, our engineers came to the conclusion that the economic design of telemetering and remote control equipment dictates that the facilities be controlled from one central point. Moreover, the entire system must be treated as a single unit irrespective of the number of stations within it; and to be effec-



THIS SCHEMATIC OF A COMPLEX GAS PIPE LINE SYSTEM faces the dispatcher in Peoples Natural Gas Company's Pittsburgh office. The system which delivers up to 500 MMCFD and has 272,000 customers, can now be controlled by pushbutton.



MAP OF THE SYSTEM, showing location of the five stations in southwestern Pennsylvania.



SCHEMATIC OF INSTRUMENTATION at McKeesport Station.

tive, the dispatcher must have information which will enable him to visualize all operations and analyze any situation that arises within the system.

With the expansion of the pipe line system, *more security and safety features* were mandatory. When *greater accuracy* and *dependability* were added to the list, it seemed obvious that a truly supervised, all-relay, digital system was the answer. This recommendation was made to management, and the following stations were selected for the initial program: Blackhawk, Mount Royal, Chalfant, McKeesport and Vinco with additional telemetering and functional control from the Pitt Street Shop.

From the outset, it appeared that the desirable features of a control system would include monitoring pressures, temperatures, flow, etc. at each station and controlling the necessary gate valves and regulators. Flow, pressures and temperature information should be automatically transmitted to the dispatching center. After many months of study, a system incorporating the desired instrumentation and another manufacturer's supervisory equipment was selected.

One of our objectives was to supply the dispatcher with intelligence rapidly and in an easily interpreted form. A careful study of this objective eliminated an elaborate instrument room. It is almost impossible to read an instrument without fairly close examination, and filling a dispatcher's office with numerous gages and recorders seemed impractical. On the other hand, printing the data out on a typewriter or on digital indicators places the data in a form which is easily assimilated by a dispatcher. This makes it easier for him to reach an intelligent decision concerning the course of action.

Methods of Transmitting Data. The most common method of transmitting pipe line information in the past has been the *time-impulse* method. This means keying a narrow communication channel for a length of time proportional to the amount of the measured variable. *On* and *off* time periods are complements of each other and establish definite proportional positions of a pointer or pen at the central location. Another method of transmitting data is to vary the frequency of the signal in proportion to the measured variable. These methods are analog rather than digital: and analog systems are considerably less accurate than digital and more subject to error as a result of normal circuit noise and signal interruption.

Why Digital Telemetering Was Selected. Digital telemetering—which involves telemetering of numbers—provides the shortest route from telemetered values to automatic data logging of information. A few justifications for automatic data logging are as follows:

- It frees the dispatcher from routine logging of intelligence from re-

corders, some of which are not easily read with consistency.

- All data is logged simultaneously.
- A short logging time means more data is available for assimilation by the dispatcher.
- Available employees with an aptitude for instrumentation and electronics are being trained to operate and maintain these control systems and computers. Along with this training, a broad knowledge of orifice measurement and pressure controllers is very desirable in the over-all program.

How Instrumentation and Controls Work

By H. M. Joiner, Chief Engineer, The Peoples Natural Gas Co.
and L. B. Lumpkin, District Manager, The Bristol Co.

THE NEW DISPATCHING system described here is the result of years of study by Peoples' Operations and Engineering Department. Cooperating closely in this study were technical representatives of The Bristol Co. and The Westinghouse Electric Corp.

The objective of the study was the development of a system to provide the company's customers with the most reliable and economical supply of natural gas possible.

What Is Involved. The system involves the automatic remote operation of five major regulating and metering stations, as listed above and on the map. The pipe line network has handled a peak load of over one half billion cubic feet of gas per day, supplying one quarter of a million customers.

The entire dispatching system described here, operates on a digital basis with all measurement, control, alarm, deviation, command and logging functions handled in this manner. Security and reliability have been built into the system. The use of all servo transducers, a self checking code and check backs on all selections and control commands makes the chance of false operation very remote.

We believe that this system represents the most advanced techniques in measurement, control, and telemetering for gas dispatching.

Although the instrumentation and supervisory controls used in this system are inseparably interrelated and interlocked, for purposes of clarity we will discuss them separately. For the sake of brevity, only representative functions will be covered but a tabulation is included showing the measurement and control functions handled between the dispatcher's office and the five remote stations.

TABULATION OF FUNCTIONS AT THE FIVE STATIONS

Function	Chalfant	Blackhawk	McKeesport	Mt. Royal	Vinco
Pressure Measurement	3	4	6	4	3
Computed Flow Measurement	4	2	2	1	2
Temperature Measurement	0	1	0	0	0
Remote Control Set Point	0	1	5	0	1
Remote Alarm Set	3	4	6	4	3
2-Way Remote Valve Operation	0	2	0	1	0
Throttling Valve Operation	3	1	5	5	3
Bi-Directional Flow	1	0	0	0	0
High & Low Alarms	3	4	6	4	3
Deviation Indication	0	1	5	0	1
Totals	17	20	35	19	16

In addition to these, many of the Chalfant Station functions are sent to and controlled from an additional dispatching center located at Pitt Street by a combination of analog and digital means. This center operating under the direction of the main dispatching center in Pittsburgh handles the dispatching of gas to the City of Pittsburgh.

Transducers used for measurement. To provide accurate measurement and sufficient power for alarm and deviation signals, transducers are used for all measurements. Basically this is a servo motor operated instrument which measures the variable (pressure, flow, temperature, etc.) and converts it into a common electrical signal (slide-wire position) for easy conversion into digital code and transmission to the dispatching center.

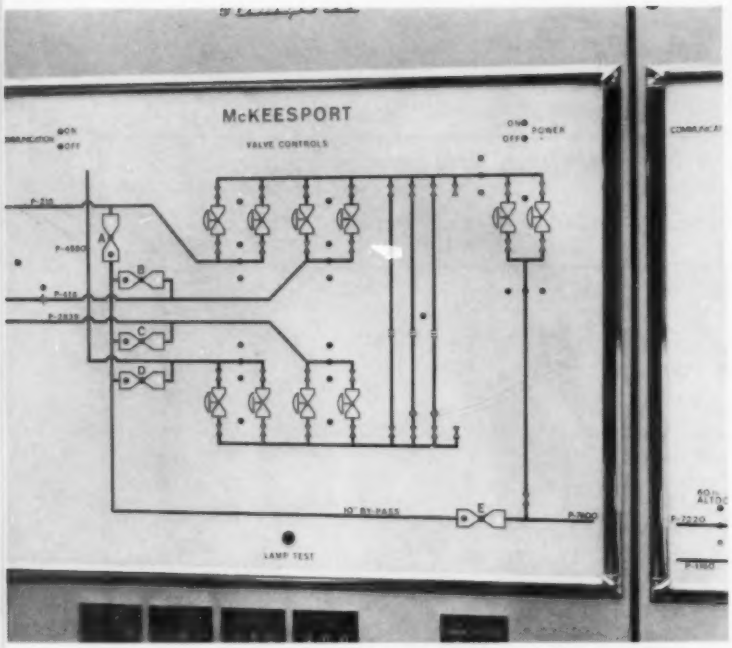
Analog totalizer computers. To reduce the number of transmitted signals and to save the dispatcher manual computations, **flow, pressure** and **temperature readings** are fed into analog totalizer computers so the dispatcher receives his total flows corrected for pressure, temperature, specific gravity and super compressibility.

These measurements are converted into digital signals for transmission to the dispatcher's office. A digital voltmeter is used for this conversion and is switched from each measured variable to another by the supervisory equipment.

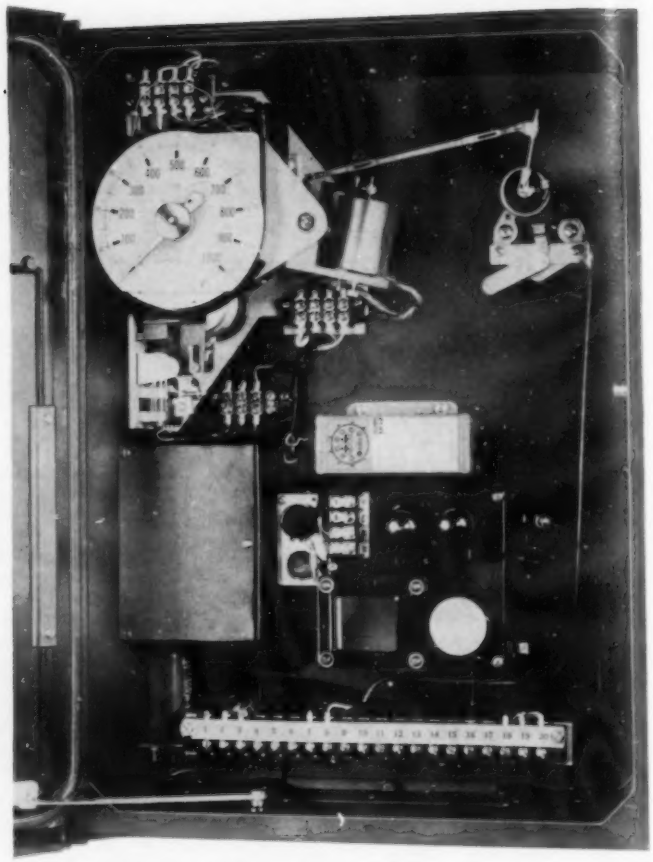
All of the measurement functions are transmitted digitally to the dispatcher's office and the regulators in the remote stations are controlled by commands from the dispatcher. This is accomplished in a unique way.

How the Control System Works. The dispatcher selects the point of control by pressing a button. He then sets a manual digital indicator to the desired control value. After a series of automatic checks, the control value is digitally transmitted to the selected controller at the proper station. This digital code is converted into a pneumatic signal which is the set point for a controller which operates the parallel regulators to maintain the required pressure.

Deviations. All of the controlled measurement servos are equipped with deviation contacts. Their pur-



CLOSE-UP OF McKEESPORT STATION PANEL. Note that readings at bottom are digital. Data logger also collects and types out information governing entire pipe line system.



BASIC INSTRUMENT COMPONENT which converts flow, pressure, etc. signals into electrical signal that can be converted into digital code for transmission to dispatching center.

pose is to notify the dispatcher when the reading deviates from the desired control value. These signals are transmitted by digital code to the dispatcher's office and are indicated by flashing lights on the map panels at the proper location.

Pressure Alarms. All pressure measuring instruments are equipped with remote set alarm contacts. These contacts notify the dispatcher, via digital code signals, when the measurement exceeds desired values by an audible signal and a flashing light at the point of measurement on the map panel. As these values need to be changed with changing loads or conditions, the dispatcher can reset these contacts to new operating conditions from his console.

Remote station map panels are specially designed plastic panels on the equipment cabinets in the dispatcher's office. They have a schematic of the piping system of the station equipped with signal lights and arrows to keep the dispatcher informed of the condition of all of the equipment shown as well as deviation points, alarm points, measurement points and condition of the communication channel.

Immediately below the map panels are digital indicators which continuously display all of the readings being transmitted. On those measurements which are remotely controlled, digital indicators show the set points and the measurements.

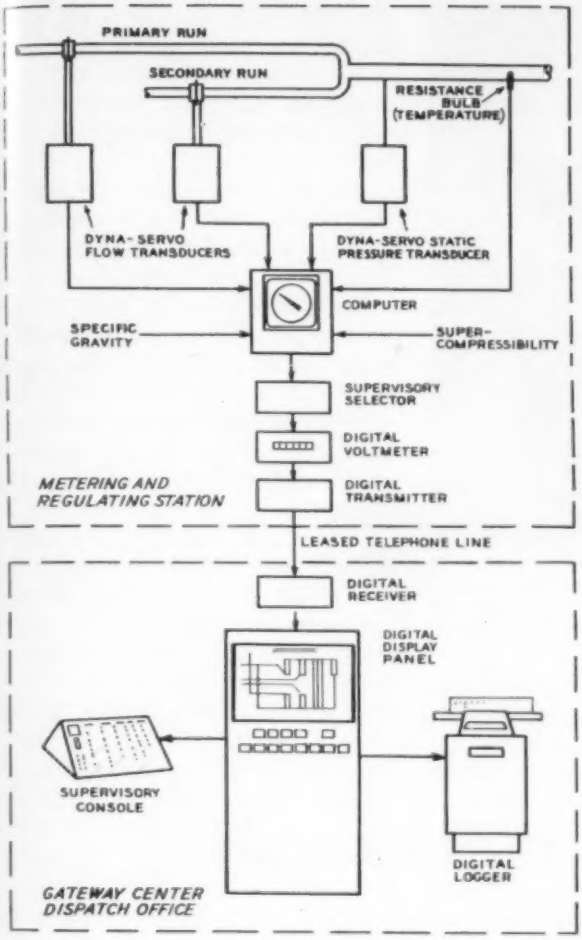
Data Logger. A record of the dispatching operation is typed out on a data logger. Those points which are in alarm condition are typed in red. This equipment logs the entire system on a timed basis, or the entire system can be logged on demand. This saves the dispatcher the labor of manual logging and leaves him more time for study of the system and control functions.

A control console on the dispatcher's desk contains a common digital indicator for an individual reading on a demand basis or for following a reading closely. The console also contains a manually set digital transmitter used to set the required control value for the remote controllers as described above.

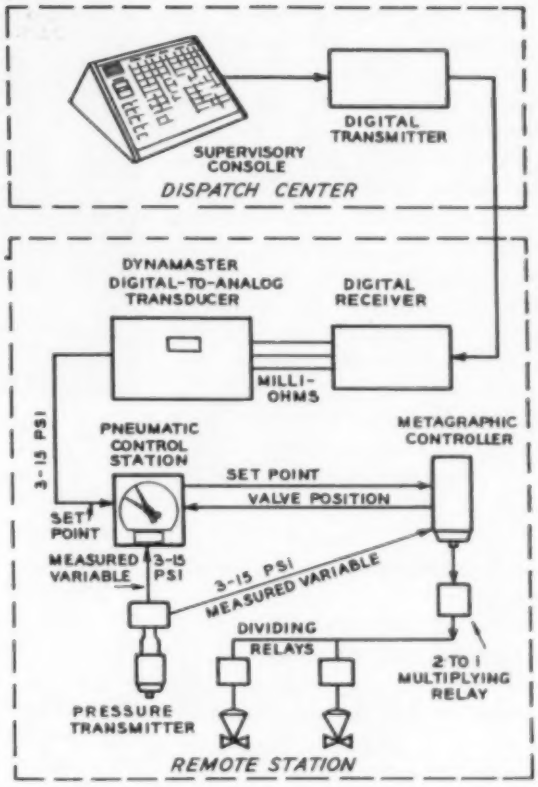
Push buttons on the console allow the following operations by the dispatcher:

1. Call for any reading in the system on demand.
2. Up-date all indicators without a log.
3. Up-date any single station's indicators without a log.
4. Institute a manual log cycle.
5. Select a controller and set its control point.
6. Select an alarm instrument and reset its alarm contacts to a new position.
7. Select and operate 2-way valves in system.
8. Select and operate 3-way throttling valve in the system.

The supervisory and communications portion of this system is an adaptation of a new system designed for the U.S. Air Force for missile testing work. It is an all relay system employing components that have been proved by years of service.



BLOCK DIAGRAM showing how differential, pressure, temperature, etc. are combined into digital code for transmission to the dispatching center.

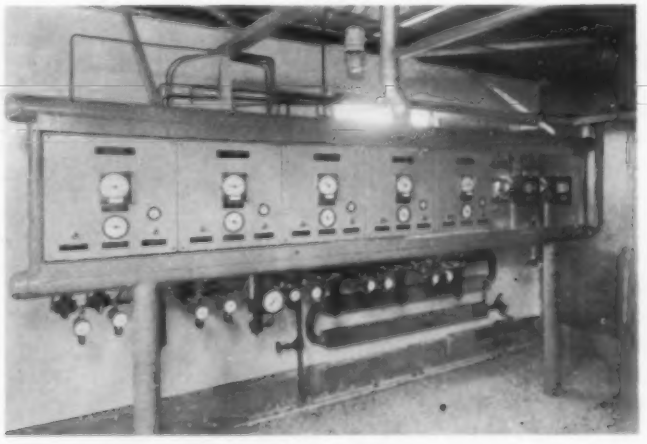


SCHEMATIC OF CONTROL SYSTEM. Dispatcher can set control points from the Pittsburgh office.

The telemetering and control functions employ, a five bit binary code with a self checking feature. This feature requires that the correct number of short and long bits be received as well as checking the total number bits before passing the signal as a valid code. As a further safeguard of the system, each selection of a control point and each request for information must be answered by a duplicate code from the selected station before the operation is completed. This check-back gives the dispatcher a check on the accuracy of his operation as well as a safety check on the accuracy of the supervisory and communication system.

System Scanning. Not only may the dispatcher call for and receive the readings from any or all of the instruments in the five field stations, but this data is continuously displayed on digital indicators on the control panels, just under the piping panel of the appropriate station. Also, at timed intervals or on command from the dispatcher, the supervisory system will scan all readings and log them in the correct columns of a daily log sheet by means of an automatic electric typewriter. Those read-

MAIN CONTROL PANEL at McKeesport station.



REMOTE SET CONTROL PANEL at McKeesport station.

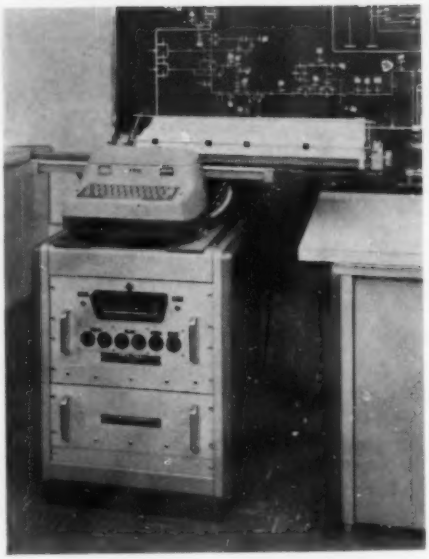
ings which are in an alarm condition are typed in red.

Alarms and Re-sets. Besides the measurement and logging functions described above, the supervisory system, by means of coded signals, advises the dispatcher if any condition is outside of normal limits at any of the remote stations. Field servos are equipped with alarm contacts as described earlier. The supervisory system picks up this information, transmits it to the dispatching office, sounds an audible alarm and flashes an indicator light at the point of alarm on the appropriate piping panel on the equipment cabinets. The dispatcher may transmit a coded signal that will cause the measuring instrument to reset these alarm contacts to new values as conditions demand.

Pressure Deviations. A similar set of contacts in instruments that measure controlled pressures will advise the dispatcher if a controlled pressure deviates from the desired control value. This operation is also handled by means of a binary code by the supervisory equipment and is indicated by flashing lights on the piping panels at the point of measurement.

Remote Controls. In addition to measurement, alarm and deviation information from the field, the dispatcher must be able to perform control operations at the remote stations from his control console and be constantly advised of the condition of these controls. These functions involve setting the desired control points on control instruments; operating valves both open and closed, and throttling type; and setting alarm points.

Pushbutton Controls. For the remote set point, a manual digital indicator is installed on the control console. The dispatcher sets this indicator to the desired pressure. The supervisory system is designed so that the dispatcher presses a push button on his console to select the station and control instrument to be set. A coded signal is sent out to the station and selects the controller. The remote station sends back a coded signal confirming this selection and lights a signal light inside the operated button as a safety check. Only after this sequence can the dispatcher push another button to send the set point to the field. As a further check the set point is indicated on the proper digital indicator on the equipment cabinet. To operate valves in the remote station, the dispatcher's console contains selection buttons for each valve and it also has command buttons for open and close. By a very similar system of coded signals and check backs as described above, the dispatcher can select the station and valve and perform the required operation.



DATA LOGGER in dispatcher's office will type out record of entire system on a timed basis. Alarm conditions are printed in red.

On the piping panels on the control panel, each valve is shown symbolically with three lights built into the symbol. One indicates open, one closed and the third light is point identification. Thus, the dispatcher is continuously advised of the position of all valves and can operate them as required from his seat at the operating console. Finally, the dispatcher needs to know the condition of his supervisory and communications system. Lights on each piping panel will indicate the loss of communications and power to each remote station.

This dispatching system incorporates the most modern techniques of automatic and supervisory control available today. We believe that this system handles a larger variety of functions, employs more security features and automatically operates stations handling a larger volume of gas than any automatic dispatching system of this type in existence.

—The End

About the Authors

Kraus

Joiner

Lumpkin

A. F. Kraus was chief gas measurement engineer for Peoples Natural Gas Company when he retired in July. He had spent 45 years with the company and was a pioneer in the industry responsible for many advances in the gas measurement field. Kraus was a founder of the annual Appalachian Gas Measurement Short Course at West Virginia University and served on numerous committees in developing the program.

He attended Curry College and Carnegie Tech in Pittsburgh and was a member of the AGA, ISA, Western Pennsylvania Engineers Society, and Western Pennsylvania Natural Gas Men's Association.

Howard M. Joiner is chief engineer for Peoples Natural Gas Company. He has been with the Peoples organization since 1936, when he joined Hope Natural Gas Company. In 1949, he was transferred to Peoples Natural Gas and in 1954 named chief engineer.

Educated at Little Rock Jr. College and the University of Missouri, Joiner also has served on several AGA operational committees. From 1942-46, he served as an officer with the Coast Artillery Corps.

L. B. Lumpkin was graduated from North Carolina State College with a degree in chemical engineering in 1933. He has been with the Bristol Company since 1937 and became manager of the Pittsburgh district in 1956.

Lumpkin has worked directly with Westinghouse Electric Corp. and several gas companies in supervisory and instrumentation controls.

How to Run a Testing Program

A good testing program is a valuable management tool in employe selection, placement and evaluation. You should, however, consider these points before launching a program

By John D. Quinton
Tennessee Gas Transmission Co.
Houston

THE PSYCHOLOGICAL tests given in industry today are used in arriving at decisions which may have great influence on the ultimate welfare of the employes tested, and of the company. Test users, therefore, should apply high standards of professional judgment in setting up a testing program.

Before launching the testing program upon a sometimes rough and stormy industrial climate, there are a few factors that should be considered. If a company is unwilling to go the correct route in establishing a "complete" and sound program it is perhaps better to stay out of testing altogether.

What is meant by a "program?" A program, as far as testing is concerned, implies orderliness and planning. It is a systematized procedure of carrying through the testing sequence, instead of a one-shot or sporadic farce. The hit-or-miss technique has been one of the chief reasons for the failure of many industrial testing ventures.

Administrator should practice

Another historical weakness is the use of a short-range or one-time testing venture that produces only a fraction of the positive results that a well planned, varied, long-range program could produce.

Before we look at the general procedures for developing a testing program, however, we should consider certain factors about tests and testing. If you are toying with the idea of testing employees, you may want to put off your program after considering these points. Because, if your thinking is not compatible

with these, there is no reason for launching into the testing program itself.

HOW TO TEST

1. Standardized tests can help in the selection and placement of employes only when used intelligently by personnel people. The test producers have produced tests that can be of the greatest possible service and have also supplied manuals and associated aids that are unambiguous, comprehensible and complete. Such directions and information must be followed precisely and intelligently or else the results will be misleading and useless.

2. Test results should be used. If all the test results that have never been used and are lying in locked files were stacked in one stack the Empire State Building could rest in its shadow. Many millions of man-hours and dollars have been wasted on testing programs where the tests were given, scored and "locked in a secret file" to serve no purpose other than take up valuable storage space.

3. Use the results not only for selection and placement but as a stimulant for personnel people to change their methods, redefine their purposes and modernize their procedures and policies.

4. No final and important decision should be made on the test results alone. Psychological tests and methods should be used only as supplements to other employment procedures.

5. Do not reproduce the whole or any part of a test. It is a violation of the author's or publisher's copyright. In addition, many tests have been standardized using an exact and predetermined format. Any changing of the format would invalidate the test results.

6. It is better to give a battery of several tests than to rely upon a single test.

If the corporate thinking of people involved in planning a testing program can pass this test, then (and only then) should they consider these procedures for developing a testing program. Whether you are considering a limited or a long-range, comprehensive testing program, the chronological steps to follow in a complete program are as follows:

Ascertain The Purpose. What are you going to do with the results? Do not be too general, but be as specific as possible. "To improve the selection and placement of personnel" is not specific enough and can be classed as a "Mother Hubbard." "To improve the selection of technicians and draftsmen and thereby reduce turnover," is better.

The purpose should define both the type and scope of program you will develop. One word of caution though: do not try to undertake too large a program at first. In fact, it would be better to be less ambitious by starting small where success is more assured.

Use the results

Keep records confidential

Actually, there are two important factors to keep in mind while determining the purpose, or the testing program is doomed before it gets started. These are:

1. Ascertaining the purpose must be a combined effort. The program will not go well if one person or section determines the purpose and passes it on to everyone else. The success of the program depends upon its acceptance by all who will use it and upon their having participated in its formulation from beginning to end.

2. It must be a practical purpose. It would pay dividends if you would make a list of questions and problems that could be solved by testing. Again, testing should not be done just for testing's sake.

An imaginative and creative manager will use the test results in a variety of practical ways which will more than offset the modest cost for test material.

Selecting the Tests. Tests for selection, placement and advancement of personnel are classified in several different ways. They can be group or individual; aptitude or achievement; instrumental or paper and pencil; I. Q. or informational, etc. Since it is highly important to select the correct tests for the predetermined purpose and to use only tests that have themselves been tested, it is imperative that the best qualified persons make the selection.

If your company does not have such persons on its staff, a reliable industrial or clinical psychologist can be called upon. These people are thoroughly trained and experienced and can work closely with the company in planning the testing program.

Giving The Tests. This step is extremely important. If the tests are administered by an incompetent person the entire testing program has failed. It might be wise, then, to select tests whose administration is not beyond the capabilities of company personnel. The administrators should practice giving the tests many times until there is no doubt about their efficiency. Many testers find that it helps to take the tests before giving them. This makes it possible for them to understand the problems of those taking the tests.

The tests should be given under as ideal a situation as possible. This would include:

1. A well lighted room that is not too hot or cold.

2. Privacy—avoiding all distractions and interruptions.

3. Comfortable table and chair.

The administrator, too, must meet certain requirements. He must be able to read well and give instructions clearly. He must keep time accurately, using a precision stop watch. A few seconds over or under

the time limit will invalidate some tests.

And last, and immeasurably important, is the following of directions for administration—directions *must be followed exactly*. Any change or modification in giving the tests will invalidate the results and the analyst will not be able to compare them with the norms for that particular test.

The administrator should also be courteous, sympathetic, and understanding. Often he spends more time with an applicant than anyone else. Since first impressions are lasting, the employes that are hired will judge the company by those impressions, and rejected applicants will form their opinions of the company on these first impressions. If the impressions are good the company will retain a customer; if bad, not only will the company lose this customer but he will influence others to buy other companies' products.

Thus, a very important part of the administrator's job is to be sure the people react favorably toward him, the tests, and the company.

Scoring. Don't let the apparently simple procedure of scoring fool you. Studies show that, even when scoring keys are simple and objective, many scoring errors are possible. Errors are due to misreading or misunderstanding the scoring directions, carelessness, errors in adding and subtracting, transposing numbers, misuse of scoring key, and errors in entering scores in appropriate places.

To prevent errors the scorer should study the tests, the manual and the scoring key. He should be taught how to score and not left to his own learning devices. In addition, a random sampling of scored tests should be rechecked to determine the accuracy of the scorer. Absolute accuracy should be the goal of both the scorer and the company. A lasting injustice can be done an applicant when the scorer is careless and inaccurate.

Interpreting The Scores. It is beyond the scope of this article to go into all the ramifications of the statistical analysis of scores, graphical presentation, use of norms and the analysis of errors. However, it is obvious that the value of test scores will depend upon how well they are understood and interpreted.

Generally speaking, most tests are of the type whose test scores can be compared with "norms." These norms are supplied by the individual who standardized the test. If an applicant is up-to-norm on a test he is average. If he is above norm he is better than average.

In other words, the applicant is being compared with hundreds of other people who have taken the test. However, if a tester knows from actual trial that persons above a specific score make satisfactory employes, it is not necessary for him to compare the applicant with the test norms. Furthermore, after a test battery has been used for some time, the company may want to set its own norms or standards.

Regardless of how norms and other standards are used, the person interpreting test scores must know what he is doing. Since norms and standards are usually presented as means, percentages, or standard scores, the interpreter must have at least a rudimentary knowledge of such measurements.

The important part is that the tests are only as good as the interpreter. Therefore, a person trained in analyzing and interpreting scores is a necessity in any testing program.

Using The Results. Proper use of test results is the most important step in the entire testing program. All the effort and time expended on the selection, giving, scoring and interpreting of the tests is wasted if the results are not used or if they are improperly used.

The use of the results, of course, depends upon the purpose of the testing program. Was it to select better technicians? Or better engineers? Or were they used to find personality difficulties among present employes? Or were they to help in the selection and placement of craftsmen from present employes?

Whatever the purpose, the essential point is that the test results should be used; for the failure to use the results in a practical way is to toll the death knell of the testing program.

In addition, well-kept records of the results are indispensable to the success of a testing program. These records can be used for further study, for reporting progress and success to the department manager, the administrative group and other interested parties. Such records and reports should, in all cases, be kept confidential and in a locked file.

In Conclusion. We can see that the undertaking of a testing program is a serious and not uncomplicated procedure. The general procedure as outlined in the article is to ascertain the purpose, select the proper tests, administer them correctly, score them accurately, interpret the scores expertly and then use the results in as practical a way as possible.

The proper development and use of a testing program should give direction and efficiency to employe selection, placement and evaluation. The program can add a great deal to a manager's box of tools for objective and scientific fact finding.

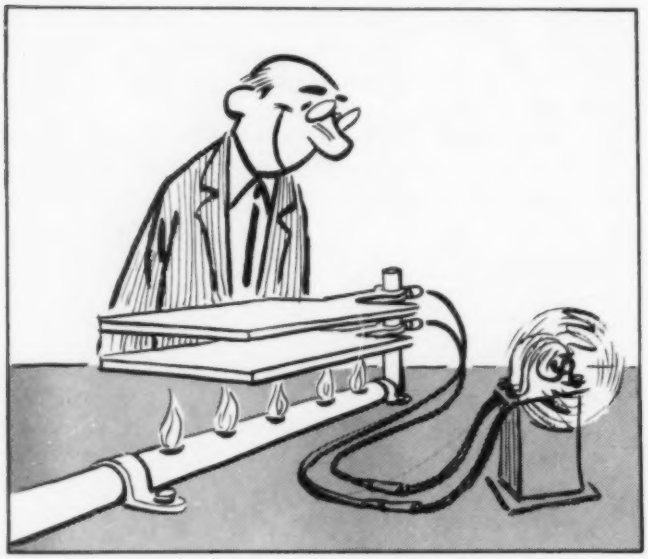
—The End

About the Author

John D. Quinton is a training representative for Tennessee Gas Transmission Co., Houston, where he develops and presents training programs. Holder of a B.A. degree from Lincoln Memorial University and a M.A. degree from Tulsa University, he also completed two years' work toward a Ph.D. degree at Kansas University. All of Quinton's studies have been in industrial and clinical psychology. He has been a professor at Kansas and Tulsa universities, and has headed the Psychology Department at Arkansas Polytechnic College. Quinton was a consultant for Service Pipe Line Co., Tulsa, for two years, and a training representative for Shell Pipe Line Corp., for four years, before joining Tennessee Gas.

Ideas for the Future

By Donald M. Taylor, Engineering Editor



Thermionic converter – Simplest way to change heat to electricity

Almost every research laboratory in the country is working on some means of converting heat or the energy of fuels directly into electricity.

The reason?

Present day methods of generating electrical power from fuels are inefficient. We burn a fuel to produce steam to drive a turbine to drive a generator. And each step contributes its inefficiency so that the overall efficiency is almost too low to talk about.

From the standpoint of simplicity and low cost, the thermionic diode holds the greatest promise in this field. It has only two essential parts—and they are two parallel metal plates separated by a small gap. One of the plates, called an "emitter," is heated. The electrons boil off of it, pass through the gap and are collected on the cooler "collector" plate.

Hooked into an electrical circuit, the thermionic diode works like a battery. And to a degree, the hotter the emitter, the greater the current.

But unfortunately, the thermionic diode has one fault which limits its efficiency to 15 to 20 percent. It's the "space charge." Seems the electrons, which are negative, charge the gap between the emitter and collector. Because of this strong negative charge, a good portion of the electrons are kept on the emitter.

The possible solutions are to make the gap smaller—say, in the order of 0.001 inch—and this will limit the negative charge which can build up in the gap. However, a gap this small proves troublesome in view of the temperature differentials, etc.

A second approach, is to fill the gap with a cloud of positively charged ions which will neutralize the space charge. This has been done with cesium vapor, which ionizes when it comes in contact with the hot emitter.

But, the most exciting approach is to make the emitter out of some fissionable material which will provide both a source of heat and a source of radiation which will produce positive ions that overcome the space charge.

Engineers are anticipating that if the thermionic diodes are used as topping units for nuclear power plants, the overall efficiency can be raised to something like 60 percent. The diode would make electricity directly from the fission, and the exhaust gases could be used to power turbines.

If this proves feasible, it could double the efficiency of present-day nuclear plants.

More non-lubricated bearings

A built-in lubricant made of gold, silver and oxides of each metal, may find uses in the pipe line industry as have other dry lubricants (such as molybdenum disulphide). This new metal lubricant will withstand a temperature range of —100 F to 1500 F when it is applied to a thickness of only one milli-inch!

Developer of the new product is General Magnaplate Corp. of Belleville, N.J.

Conductive epoxy which solders without heating

If you're all thumbs when it comes to soldering, take heart!

There's a new epoxy solder which will soon be marketed which can stick the wires together without heat. Moreover, the resistance of the joint is slight—resistivity of the compound is less than 0.01 ohm-cm.

The epoxy solder comes in two forms. The *one component* type requires thermal curing at 260 F and a two component type which will cure at room temperature. As for bond—the steel to steel bond has been measured at 3,200 psi.

This new material will be a blessing to those using

J. Ralph Orr (right), Superintendent, and Ted Ogan, Shift Engineer, Marshfield Station. In background: one of three Cooper-Bessemer GMWA-8 compressors and its En-Tronic control.

Now...gas from Canada joins U.S. supply

This compressor station at Marshfield, Wisconsin, recently made history. Here, for the first time, Canadian gas entered the midwest for the U. S. market to bolster supplies for Michigan-Wisconsin customers and to provide added security for these utilities.

This new transmission station of Michigan Wisconsin Pipe Line Company, equipped with three 2,000 hp Cooper-Bessemer GMWA-8 gas engine compressors, handles 158 MMCFD, boosting pressure from 500 to 975 psi. Also, Cooper-Bessemer En-Tronic Controls provide complete sequential starting, automatic control of gate valves and full protection. Contractor for the station was Stearns-Roger Manufacturing Company.

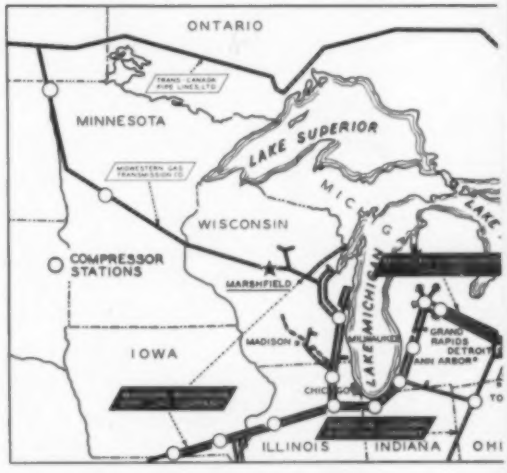
The Marshfield Station is one of many in the vast Michigan Wisconsin system which are equipped with Cooper-Bessemer gas engine compressors, some with records of more than 10 years of sustained operation.

When you plan compression facilities, it will pay to call in Cooper-Bessemer engineers for assistance.

Cooper Bessemer

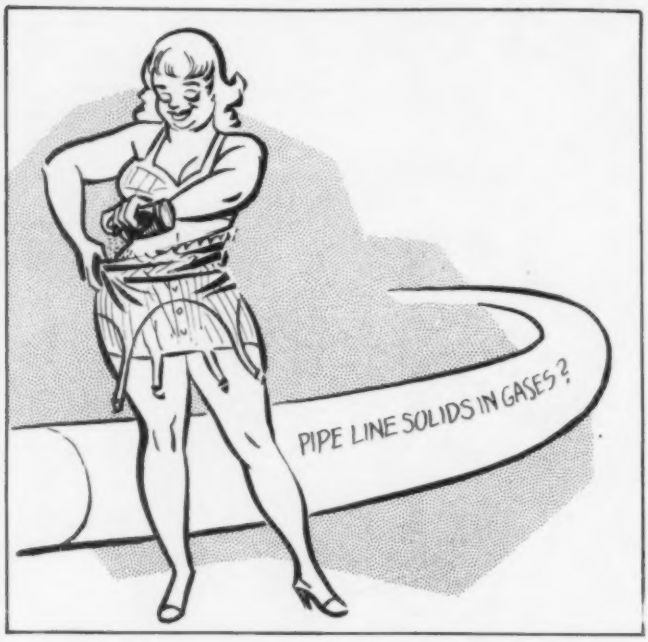
GENERAL OFFICES: MOUNT VERNON, OHIO

COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINES: GAS - DIESEL - GAS-DIESEL
JET-POWERED GAS TURBINES



Map shows location of Marshfield Station and how it connects with lines in that part of the country.

printed circuits where heat is highly undesirable. Also, it fits in well with organic conductors and semi-conductors described in June PLI page 71.



Multi-million dollar "Whoosh" may hold promise for pipeliners

Something new has been added to the squirt-top cans. And this may be important news for pipeliners!

After 10 years of trying, teams of chemical engineers have made an important breakthrough in the aerosol can business. As a result, you'll soon be able to purchase all sorts of solid powders in the little cans with the concave bottom and the red push-botton top. (And the list of projected items will include all sorts of cosmetics, bug sprays, pharmaceuticals, household products. One enterprising manufacturer will market a "slick'um" powder which will help corpulent females slip into their streamline girdles.)

Why has this development, which is a natural follow-up of the aerosol bombs of World War II, been so long in coming? There are three big reasons. First, the powders tend to cake inside the container; and second, the payload has necessarily been held to a skimpy 10 percent (by weight) of solids; and third, the solids have always managed to foul the valves.

Here is how today's developments lick these problems:

1. A new valve has been developed which eliminates clogging, yet prevents leakage of the propellent.

2. A chemical "latticework" has been devised to hold the powdered particles apart so they can't cake. The material is a low density siliceous material in which the product "floats" in suspension.

3. Containers can now be filled from 25 to 50 percent by weight.

Who knows, someday the idea may make it possible to pipe line solids in gases rather than in liquids!

How the lead industry is "getting the lead out"

The word, *lead,* suggests slow movement and lethargy, and until recently, this too often constituted an accurate description of the lead industry.

But this changed recently. The Lead Industries Association is keeping pace with progress in other industries and seemingly is busy applying the needle to its own constituents right where it will do the most good. In short, the lead industry is "getting the lead out"!

Proof of this was apparent at the annual Lead Industries Association meeting in Chicago. The industry displayed considerable upgrading of its own products and came up with some brand new uses for the heavy stuff. Here are some examples of innovations in lead:

A Ceramic Spark Pump That Improves Ignition of Gasoline Engines.

A new ignition system, a fraction the size of the usual equipment (magneto, coil, condenser and points), is already finding a market in small gasoline engines. The units are no bigger than a man's fist, yet one of them will produce a 20,000-volt spark when given a short pump-like stroke by a cam. What's more, the spark delivers constant, full voltage from engine start-up to full speed. And the spark is powerful enough to break through fouled plugs. In field tests, the device has started gasoline engines in a quarter to half of a turn.

What produces this phenomenon? As described some months back in PLI, the spark pump is based on *piezoelectricity.* Simplified, this means that some ceramics produce electricity when pressure is applied to them. The best such ceramic discovered to date is called PZT which stands for lead zirconate-titanate.

What will this new ignition system mean to pipeliners? For one thing, the small pump engines which have always been so contrary on cold damp days will kick off on a moment's notice. Moreover, the lawnmower at home will soon be doing likewise!

The Clevite Corp., which pioneered work in this field, is predicting that PZT will find market opportunities in larger engines in the future.

Lead Ceramic Transducers. Lead is also being used to change electrical energy into mechanical energy. A lead-ceramic material can produce ultrasonic sound which can clean eyeglasses, jewelry and small precision parts.

A Lead-telluride thermoelectric device is converting waste heat into electricity.

New improved batteries. This summer will start a series of application of batteries to markets formerly monopolized by gasoline engines. For example, Lawnshear Corp., of West Point, Pa., is producing a battery-powered lawn mower which can be re-charged by plugging into the house current.

Other uses of lead which were demonstrated at the association meeting were:

- Lead anodes for corrosion protection
- Dry bearings of leaded Teflon and lead monoxide ceramics

—There's little doubt about it—the lead industry is getting the lead out!

"HOUSTON BUILT"
To men in pipelining, "Houston Built" means quality construction efficiently handled and completed on schedule. This enviable record has placed Houston among the first to be considered when new construction is planned. Why not talk to the men of Houston on your next pipeline project?
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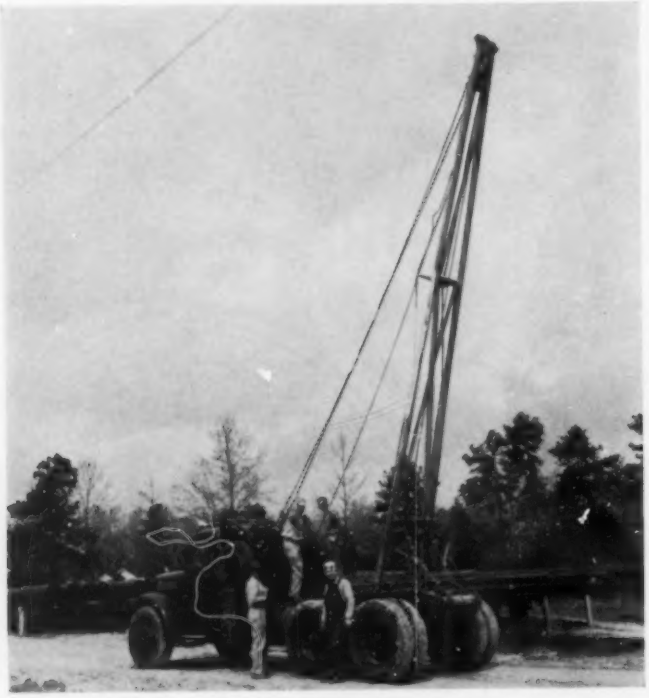
$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Use Extra-long Gin Pole For Station Construction

Shown here is a field fabricated gin pole for a truck tractor which proved highly useful in constructing overhead piping, and setting heavy equipment at a station construction job.

The gin pole was made of four-inch drill pipe, and the welds made during fabrication were pre-heated then cooled slowly after they were complete.

The drawworks for the unit is an ordinary oil-field type truck winch. The overhead guys are attached to the truck frame, and ordinary heavy-duty load binders are used to keep the boom from flopping over the truck.

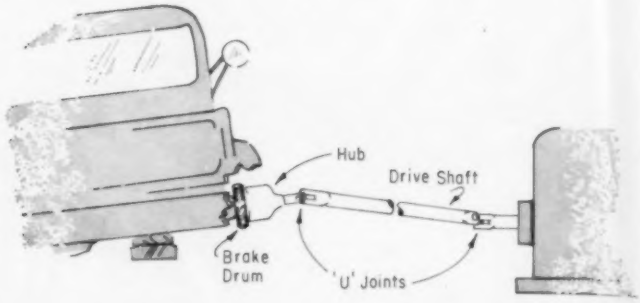
The block used in the crown is a heavy duty, 15-ton block lashed in place to keep it from jarring loose when the unit is moved without a load.

Note the strong backs and the X-bracing used to strengthen the pole.

Emergency Pick-up Truck Power Drive for Pumps, etc.

How would you like to have a 150 horsepower engine always at hand for emergency use. It has a clutch, variable speed drives and can be temporarily used to supply power for almost any stationary equipment such as pumps and welding machines.

Your pick-up truck can do just that. All you have to do is to jack up one of the back wheels, dog the other

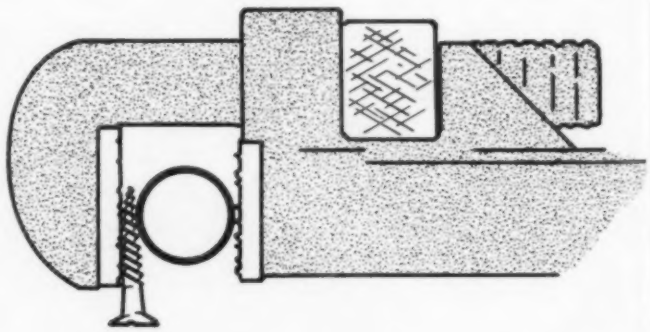


one off, remove the tire and wheel, mount a hub in its place which connects to a drive shaft which has two "U" joints to take care of any misalignment.

Such a unit has been used by pipeliners to power a homemade concrete mixer (used for pouring anchor blocks) a pump and a windlass. It could also be adapted for welding machines and large centrifugal pumps.

The hub which bolts on in place of the wheel ties directly into the first universal joint. Allow 4 to 8 feet of shaft between the first "U" joint and the second one to permit elevation change, etc., then use a spline connection which will fit the unit to be powered.

This is not to suggest that the next time emergency comes, when a secondary power source is desired, that you can quickly tie into the engine of your pick-up truck. Instead, the emergency kit which will convert it for driving a pump, a welding machine and perhaps a concrete mixer should be devised ahead of time. Then, of course, it will be ready when the emergency comes.



Insert Screw or Bolt In Wrench Jaw for Teeth

Sooner or later there comes the time when pipeliners have to make an old pipe wrench bite—even though its teeth are almost gone. Here's one way of doing this.

Insert a wood screw, stove bolt or machine screw in the jaws as shown and chances are the slippage will be eliminated.

WHAT'S HAPPENING
IN PIPE LINE CONSTRUCTION

By **Donald G. DePugh,** Construction Editor

Photo courtesy Link-Belt Speeder Corp.

Pipelining Through Mountains

Western Pipe Line, Inc., is laying a section of the Pacific Gas Transmission Company 36-inch main line through rugged terrain in Washington and Oregon. At the top of the John Day Canyon in Oregon, a back-hoe is making a ditch through rocks. At lower left, open ditch is completed up to the bottom of the mountain. Western and J. P. Neill and Co. Inc., are constructing the 486-mile segment from the California-Oregon border to Rosalia, Wash.

Texas Gas Transmission Granted FPC Approval on Expansion Program

Texas Gas Transmission Corporation was granted Federal Power Commission temporary authorization for construction of facilities costing $17 million.

The expansion program includes about 61 miles of 30-inch, 26 miles of 26-inch, 33 miles of 16-inch, 17-miles of 8-inch, and 9 miles of 6-inch pipe and 4,000 additional horsepower.

Western Pipe Line, Inc. was awarded a contract by Texas Gas to construct 30 miles of 26 and 30-inch pipe. Western will lay 7 miles of 30-inch in Dyer County, Tenn., 8 miles of 30-inch in Obion and Weakly Counties, Tenn., and Grover County, Kentucky. Western also has 10 miles of 30-inch in Hopkins and Webster Counties, Kentucky and 5 miles of 26-inch in Breckinridge County, Kentucky.

The expansion program will provide an additional 50 MMcf of gas daily for Texas Gas system. The FPC also granted temporary authorization of 10 companies to sell gas to Texas Gas at an initial price of 23.25 cents per thousand cubic feet, including tax reimbursement.

Products Pipe Line Planned in Northwest

Olympic Pipeline Co. has been formed to build and operate a 324-mile, 6-16-inch, products pipe line serving Washington and Oregon. Shell Oil Company, Magnolia Pipeline Company and Texaco, Inc., are the owners.

The proposed $17.5 million line will extend from Ferndale, Wash., to Portland, Oregon and will serve Seattle, Olympia and Tacoma also. It will consist of 23 miles of 6-inch, 45 miles, 8-inch, 162 miles, 12-inch, and 94 miles of 16-inch.

Natural Gas Pipeline Receives FPC Approval

The Federal Power Commission has granted authorization to Natural Gas Pipeline Company of America for construction of 27 miles of 30-inch, 62 miles of 36-inch loops and 22 miles of lateral lines. Also NGPL will supercharge 73 engines at compressor stations which will add 58,-400 horsepower.

The $23.7 million project is designed to increase the system's daily capacity by 100 MMcf.

Construction of the 30-inch loops will be in Piatt and McLean counties in Illinois. The 36-inch loops will be laid in Meade, Clark, Ford, Republic, and Cloud counties, Kansas and Mahaska County, Iowa.

Pacific Lighting Gas Plans 24-Mile, 16-inch Pipeline

Pacific Lighting Gas Supply Company is seeking permission to construct a 24-mile, 16-inch gas pipeline from Gaviota to Goleta in Santa Barbara County, California.

The $1.7 million project is before the California Public Utilities Commission. The line would take offshore gas in the Gaviota area. PLCA would buy gas from Standard of Calif., Phillips Petroleum Co., and Texaco, Inc.

Plans call for pipeline to be completed this year.

United Gas Lets Contracts on 30-Inch Line

United Gas Pipe Line Company has awarded contracts on 156 miles of its $32 million 217-mile, 30-inch main line from Lafayette to Monroe, La.

Panama, Inc. has received a contract for construction of 60 miles of 30-inch extending southward from Monroe. The work will be in Ouachita, Caldwell and LaSalle Parishes.

Stanley-Bledsoe Corporation will lay 95 miles of 30-inch from the north side of Arnaudville station in St. Landry Parish extending north across Red River and into LaSalle Parish.

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Ford H-Series tractors offer a choice of five Super Duty V-8's or four proven Cummins Diesels for maximum performance, economy and durability! Over 500 engine-transmission-axle combinations provide "job-fitting" economy on any run.

New Ford H-Series tractors have a short 28-in. BA for hauling maximum legal loads in most "bridge formula" states. And their compact 82-in. BBC dimension accommodates longer high-cube trailers. For greater payloads within their 76,800-lb. maximum GCW range, strong lightweight components are used wherever consistent with maximum durability. Extra-hi-tensile steel frames, fiberglass cab skirts, aluminum steering gear housing, and optional aluminum disc wheels, transmission cases and fuel tanks are typical examples of Ford's weight-saving design.

Ford H-Series models are quality-built to the most exacting standards in the industry. They're the only tractors with gas engines so dependable they're dealer-warranted for 100,000 miles. And maintenance-engineered design means fewer downtime delays . . . lower maintenance costs.

SEVEN MORE REASONS

WHY IT'S GOOD BUSINESS TO DO BUSINESS WITH FORD!

You save from the start with Ford's traditionally low prices, and your savings continue with low operating and maintenance costs. These facts are documented by certified test reports from America's foremost independent automotive research firm. Ask to see these reports. They're on file at your Ford Dealer's.

In addition to these dollar-and-cents savings, the following bonus benefits are yours with Ford Trucks:

1. Rigid quality controls give you the strongest safeguard of truck reliability ever. Modern, *exclusive-truck* manufacturing facilities, with emphasis on quality every step of the way, are designed to give you a Ford Truck that is as free from defects as a truck can be. Tangible results of these high standards are Ford's new warranties.

2. Exclusive 100,000-mile warranty (or 24 months) on 401-, 477- and 534-cu. in. Super Duty V-8's is the most liberal in the industry. Each major engine part (including block, heads, crankshaft, valves, pistons, rings), when engine is used in normal service, is warranted by your dealer against defects in material or workmanship for 100,000 miles or 24 months, whichever comes first. The warranty covers full cost of replacement parts . . . full labor costs for first year or 50,000 miles, sliding percentage scale thereafter.

3. 12,000-mile warranty (or 12 months) on all 1961 Ford Trucks of every size is further evidence of the confidence Ford has in its quality controls. Each part, except tires and tubes, is now warranted by your dealer against defects in material or workmanship for 12 months or 12,000 miles, whichever comes first. The warranty does not apply, of course, to normal maintenance service or to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points.

4. Special fleet financing can be arranged by your Ford Dealer. It's available for owners of two or more trucks, and provides the opportunity to precisely tailor payments to your income patterns or depreciation schedules. This fleet-fitted financing offers substantial savings and frees your working capital.

5. Sales engineers and service specialists in 36 district offices are on call to solve special truck problems. Working with both dealers and customers, these experienced truck men represent another extra step Ford takes to provide your continued satisfaction.

6. Replacement parts depots at 26 strategic locations across the country quickly supply needed parts from ample stocks. Ford's entire supply system is geared to give you faster service and reduce costly downtime . . . *wherever* you are.

7. 6,800 Ford Dealers, including 280 specialized Heavy Duty truck dealers, can keep your trucks ready to go wherever they go. From coast to coast, fast Ford service—gas *and* Diesel—is always close at hand.

From Super Economy pickups to Diesel-powered tractors, you can now fill every truck need up to 76,800 pounds GCW with a modern, money-saving Ford Truck.

QUALITY-BUILT...MAINTENANCE-ENGINEERED

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For more data on advertised products, use cards, last page.

Products Line Nears Completion

Somerville Construction Company is laying section of West Shore Pipe Line Company products line alongside railroad at Jones Island Milwaukee terminal. Construction is nearing completion on the 285-mile, 10-16-inch line from Chicago to Green Bay, Wis.

Central Organization Planned For Distribution Contractors

Plans are being finalized by the distribution contractors to form a Distribution Pipeline Contractors Association. The trade association would function as the transmission Pipe Line Contractors Association does. It would serve as a central location and clearing house for information of mutual interest concerning the many problems encountered by contractors.

It also would direct its effort to improve the quality of work and improve the safety standards within the industry.

E. H. Clark, vice president of Engineering-Construction Co., Tulsa, has been appointed chairman of the organization committee. Other committee members include W. C. Donaldson of Underground Contractors, Inc., and Arthur Everham of Midwestern Contractors, Inc.

Meetings have been held during the last three months to plan development of the national association. Contractors from eight states have attended these meetings including Russell Construction Company, Midland Contractors, Inc., Reutzel Co., Inc., Hood Corporation, Utilities Service Co., and Beloit Pipe and Dredge, Inc.

Contractors interested in the organization may obtain information through the temporary organization offices — Engineering - Construction Co., First National Building, Tulsa, Oklahoma.

Sheehan Awarded Contract By Sunolin Chemical Co.

Sunolin Chemical Company has awarded a contract to Sheehan Pipe Line Construction Co. to lay 50 miles of 6-inch and 30 miles of 4-inch from Paulsboro to Deepwater, N. J.

Glacier Pipe Line Co. 430-Mile System Completed

The 430-mile, 8-10-inch Glacier Pipe Line Company crude system has been completed. The $13.5 million pipeline extends from Cut Bank to Roundup, Billings, and Laurel in southern Montana, and on to Byron near Powell, in northern Wyoming.

The Glacier line includes a 55-mile spur line from Roundup to oil fields in central Montana. The system is 8-inch except for 53 miles of 10-inch. Capacity is 50,000 barrels per day.

Glacier is owned by Continental Oil Company and Texaco, Inc. R. H. Fulton & Company and McLaughlin, Inc. were contractors.

Rocky Mountain Lets Contract to H. C. Price

Rocky Mountain Natural Gas Company has awarded a contract to H. C. Price Company for construction of 110 miles of 2-6-inch gas lines. Price will lay 35 miles, 4-6-inch gathering lines, 40 miles, 6-inch transmission lines, and 36 miles of 2-6-inch distribution lines in Colorado.

Contracts Awarded by El Paso Natural Gas Co.

El Paso Natural Gas Company let contracts on 135 miles of gas lines in Arizona, New Mexico, and Washington. R. H. Fulton & Company was awarded a contract for 61 miles of 8-inch in Navajo County, Arizona for El Paso and Southern Union Gas Co.

River Construction Corporation will lay 60 miles of 8-30-inch in New Mexico and H. C. Price has 14 miles of 30-inch near Spokane, Wash.

Canadian Firms Receive Permits

Upon recommendation of the Alberta Oil and Gas Conservation Board, the province's Mines and Minerals Department authorized three projects involving gas-liquid pipelines.

Britamoil Pipe Line Co., received approval to build its $2 million 64-mile, 8-inch line from Rimbey to Edmonton and plans to start construction immediately. Royalite Oil Co., Ltd., will start work soon on its 26-mile, 4-inch extension of its system to carry gasolines and condensates to Calgary.

The Hudson's Bay Oil & Gas Co., Ltd., project consists of 41 miles of pipeline to transport gas liquids from southwestern Alberta to the U.S.—Canada border at Carway, Alta. It's a $1.7 million program.

Permits were denied to several firms seeking approval on major projects in Alberta. These include the Provincial Products Pipe Lines system which was a 700 mile, 3-16-inch, $25 million proposal; Hydrocarbons Pipeline Ltd., 500-mile, 4-12-inch system; and the Westalta Products Pipe Line and Foothills Pipe Lines Limited lines. The Westalta-Foothills system included a gathering system in Alberta to tie-into a main line from Canada to the Chicago area.

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NEW AIRCOMATIC® PIPE LINE WELDER

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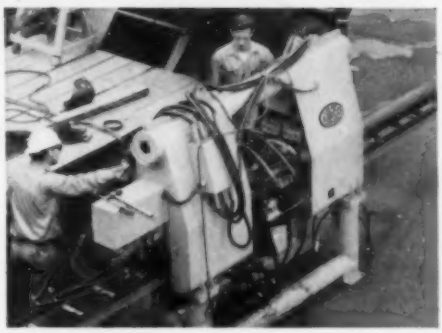

For welding speeds up to 20 times faster than manual rates—the Aircomatic Pipe Line Welder requires only one welding technician, an assistant and a tractor operator, plus the usual line-up crew.

Operation. With square butt-ended pipe in position, the Aircomatic Welder is lowered. Pipe ends are aligned and clamped. Amperage, voltage, welding speed and alignment control are preset. A power grinder slices a narrow channel through one half of the joint from 12 to 6 o'clock. The Aircomatic Welder follows the grinder to perform the weld, in one pass, under a CO_2 shield. No hand steering is needed. Following the first weld, a slot then is cut through the opposite half of the joint, and the second weld completed.

Results. The Aircomatic Pipe Welder can finish a circumferential weld in one minute . . . compared to 20 minutes for a manual weld. Welds are slag-free. Weld strength exceeds that of the pipe.

Soon available on a lease basis are Aircomatic Welders to handle 4, 6, 8, 10, 12, and 14 inch pipe. Larger models will be ready shortly. For further information write Airco today.

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Photo courtesy Grove Valve & Regulator Co.

Main Line Gate Valve

Construction is moving along rapidly on the Pacific Gas & Electric Company section of the 1,400-mile Alberta-California gas line. A 36-inch main line gate valve is lowered into ditch on the H. C. Price Company spread in California. Price is laying the 291-mile section from the Oregon-California border to San Francisco.

Texas Eastern Transmission Lets Contracts on 300 miles of Work

Texas Eastern Transmission Corporation has let contracts on its $55 million expansion program. Western Pipe Line, Inc., Bechtel Corporation, William Brothers Company and Houston Contracting Company will construct over 300 miles of 20-30-inch pipelines.

Houston is laying 161 miles of 20-inch from Monroe, La. to Kosciusko, Miss. Western Pipe Line has 17 miles of 30-inch from Wilkesville, Vinton County, Ohio to Athens Compressor station, and 12 miles of 30-inch from Moundsville, W. Va., to Wind Ridge, Pa. Williams Brothers is constructing the 40 miles of 30-inch loops between a point north of Johnstown, Pa., to Reading, Pa.

Bechtel's work includes 22 miles of 30-inch in Tennessee starting near Lawrenceburg; and 36 miles, 30-inch loops in Attala and Choctaw counties, Mississippi, beginning near Kosciusko.

Contracts for river crossings were awarded to Pentzien, Inc. Dual pipelines will be laid across the Ouachita River near Monroe, La. and the Mississippi near Lake Providence, La.

Western Slope Lets Contract to Curtis

Western Slope Gas Co. has awarded a contract to A. J. Curtis & Co. for construction of its 182-mile, 8-inch gas line from Durango to Del Norte, Colorado. The line passes over Summitville Peak near Pagosa Springs, about 13,000 feet.

Western Slope also plans a 110-mile, 8-inch extension from Del Norte to Alamoso and Antonito, Colo.

American Petrofina Plans 133-Mile Products System

American Petrofina plans to construct a 133-mile, 6-inch, products pipe line from its Mount Pleasant, Texas refinery to an existing terminal at Grapevine.

The $2.5 million system will have a capacity of 10,000 barrels daily. Right-of-way work has been completed and pipe orders placed.

ENI Considering Crude From Trieste to Austria

ENI, Italian state oil agency, is considering laying a crude line from Trieste, to Austria.

The Italian oil pipeline system presently is expanding into Switzerland with its Genoa to Aigle, Switzerland line under way. Plans call for extension of this line across Switzerland and Austria and into Germany terminating at Ingolstadt. This line would be in competition with the proposed Karlsruhe to Ingolstadt crude line.

Karlsruhe to Ingolstadt Crude Pipe Line Planned

With construction underway on the 430-mile, 34-inch crude line from Lavara, France to Karlsruhe, Germany, plans are being made for a system extending from Karlsruhe to Ingolstadt. The $7.5 million, 185-mile, 24-26-inch system will be owned by nine major firms.

BP Benzin and Petrolem AG, Deutsche Shell AG, Scholven-Chemie AG, and Deutsche Total Treibstoff, G.m.b.H., Deutsche Erdoel AG, Esso AG, Gelsenberg Benzin AG, and Mobil Oil AG, are the companies involved.

The line would carry about 160,000 barrels of crude daily. The nine companies have formed the Rhein-Donau Oeletung, G.m.b.H. to construct the line.

42-Mile, 16-Inch Gas Line Planned in Trinidad

The Trinidad and Tobago Electricity Commission is planning a 42-mile, 16-inch gas pipeline to deliver fuel at its electric power station at the Port of Spain in Trinidad.

The line will extend from the Penal fields to the Port of Spain and plans call for one compressor station. The system will be built in 1962. Howard Humphreys & Sons, consulting engineers, is doing the preliminary engineering for the Commission.

Mid-America Pipe Line Building Extension

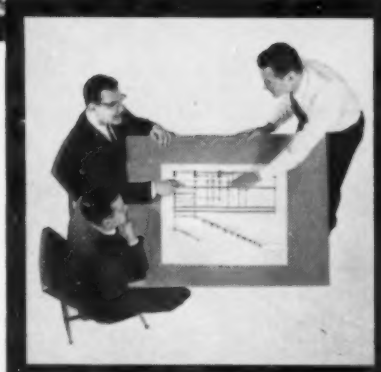
Mid-American Pipe Line Company has awarded contracts to Bristow-Hyde Construction Co. and M-R Construction Co. on its 107-mile, 6 inch extension from Whiting, Iowa to Ogden, Iowa.

Construction is expected to be completed by September 5.

Contracts Awarded on Anadarko Gas Pipe Line

R. H. Fulton & Company has been awarded a contract by Anadarko Production Company for construction on an 83-mile, 10-12-inch gas line in Kingman, Sedwick and Butler counties, Kansas.

The line extends from Spivey-Grabs, Basil field to El Dorado.



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Design Analysis: Stromberg-Carlson product engineers can assist your own staff in creating the best and most economical system to meet your needs.

Experience: We are communication specialists, backed by over a half-century of serving the Independent telephone companies of America.

Product Quality: Rigid control of all manufacturing operations is your assurance that what we make is built to "telephone standards."

Product Research: A continuing program of research and product development to exploit the latest techniques of the communication art.

Modern Manufacturing: One of the most efficient manufacturing facilities in the country staffed by experienced craftsmen using the most modern machines.

To initiate a "Pipedreaming" session, at no cost to you, call or write to . . . Industrial Sales, Telecommunication Division, 127 Carlson Road, Rochester 3, New York. HUbbard 2-2200.

GENERAL DYNAMICS | ELECTRONICS

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

* indicates that this item is a new entry or that status of this project has changed since last appearance.

U.S.

* **American Petrofina,** 133 miles, 6-inch, products, Mount Pleasant, Texas to Grapevine, Texas, $2.5 million, planned.

* **Anadarko Production Co.,** 83 miles, 12-inch, gas, Spivey-Grabs-Basil field to El Dorado, Kansas, contract let to **R. H. Fulton & Co.**

Algonquin Gas Transmission Co., Boston, 25 miles, 20-inch; 8 miles, 8-inch, gas, and 12,000 hp addition in Massachusetts, $6 million, FPC Authorization.

Ashland Oil & Refining Co., Ashland, Ky., 24 miles, 6-inch, crude, Blaine to Catlettsburg, Ky., planned.

Border Gas Transmission Company, 300 to 400 miles, gas, gathering, in South Texas, $10 million, planned.

California Gas Transmission Company, Los Angeles, (subsidiary of Tennessee Gas Transmission Company), 292 miles, 20-34-inch gas, from Mexico-California border near Mexicali, to Los Angeles and 10,000 hp. to tie into Texas Mexico-California line, $50 million, before FPC and California Public Utilities Commission.

Coastal Transmission Corp., Houston, 71 miles, 3 to 10-inch, gas, laterals; 5,500 hp in stations at Port Lavaca, Texas, and Eunice, La., and additional 1,500 hp at Robstown, Texas, $7.2 million, FPC examiner authorization.

Colorado Gas Transmission Co., 250 miles, 20-inch, gas, Southwest Colo., to Colorado Springs, before Colorado PUC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, 34-inch, gas, Green River, Wyo.,-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colorado, 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, FPC conditional authorization.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Company, Houston, 97 miles, 30-inch, loops in Kentucky, Tennessee, Mississippi and Louisiana; 29 miles, 12-inch lateral in Louisiana, $15 million, before FPC.

El Paso Gas Supply Company, El Paso, Texas, 228 miles, 30-inch, gas, main, Live Oak to Sutton County, Texas, $30 million, before FPC.

* **El Paso Natural Gas Company,** El Paso, 199 miles, 30-inch, Permian-San Juan crossover loop, before FPC.

17 miles, 30-inch, from Pacific Gas Transmission Co. facilities to near Spokane, Wash., contract let to **H. C. Price Co.**

34 miles, 20-inch, Puckett to Goldsmith, before FPC.

23 miles, 20-inch, Goldsmith to Eunice-Plains line, before FPC.

9 miles, 20-inch, Goldsmith-Plains loop, before FPC.

43,600 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, before FPC.

400 miles, 34-inch, Salt Lake City, Utah, to California border, FPC conditional authorization.

35 miles, 8-inch, gas, to deliver gas to Southern Union Gas Company in Dallas, $1 million, before FPC.

Equitable Gas Company, Pittsburgh, Pa., 31 miles, 16-inch, and 26 miles, 20-inch, in West Virginia and Pennsylvania, $5 million, before FPC.

Great Northern Pipe Line Co., 64 miles, crude, extension to Lignite field, North Dakota, planned.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla., 235 miles, 2 to 6-inch, gas, laterals; 20,000 hp in five new stations; $16 million, FPC examiner authorization.

Kansas-Nebraska Natural Gas Company, Hastings, Neb., 165 miles, 2-8-inch, gas, extension from Alliance, Neb., to Chadron, Crawford, Hemingford, Hay Springs, Gordon and Rushville, Neb., before FPC.

45 miles, 2-3-inch, gas, in Kansas, approved by Kansas Corporation Commission.

2,000 hp addition at Scott City, Kan., FPC approval authorization.

2,500 hp addition at Holcomb, Kan., before FPC.

Lone Star Gas Company, Dallas, 47 miles, gathering lines in Palo Pinto, Erath and Stephens counties, Texas, planned.

Lone Star Gathering Company, Dallas, 63 miles, gas, gathering, in DeWitt and Victoria counties, Texas, $2½ million, planned.

Long Island Pipeline Company, New York, 75 miles, 20-inch, products, Linden, N. J., to Long Island, N. Y., $30 million, planned.

Lo-Vaca Gathering Co., (Coastal States Gas Producing Co.) 230 miles, 6-20-inch, gas, gathering, Live Oak to Lavaca County, Texas, planned.

Matador Pipe Line Corp., Denver, 175 miles, crude, from Bottineau, Burke and Renville counties, N. D., to Cromer, Man., Canada, $4 million, proposed.

Michigan Wisconsin Pipe Line Company, Detroit, 88 miles, gas, 3,000 hp, take gas from Northern Natural at Janesville, Wis., before FPC.

* **Mid-America Pipe Line Co.,** 405 miles, 10-inch, LPG, Superior, Wis., to Chicago, $12 million, considered.

106 miles, 6-inch, LPG, Whiting to Ogden, Iowa, contract let to **Bristow-Hyde Construction Co.,** and **M-R Construction Co.**

100 miles, LPG, extension from Ogden City, to Charles City, Iowa, planned for 1962.

Monterey Gas Transmission Company, Houston, 216 miles, 30-inch, gas, Clear Lake, Texas, to Alexandria, La., planned.

Natural Gas Pipeline Company, Chicago, 285 miles, 30-inch; 60 miles, 36-inch and 22 miles, 8-inch, gas, and 64,200 hp, in Illinois, Texas, Arkansas, Kansas, Nebraska, Iowa and Missouri, $52 million, before FPC.

New Haven Pipeline, Inc., products line, New Haven, Conn. to Springfield, Mass., $2.5 million, planned.

Niagara Mohawk Power Corp., 122 miles, 12-inch, Watertown and Massena, N. Y., contract let to Fulghum Contracting Corporation pending FPC approval.

Northern Natural Gas Company, Omaha, 50 miles, gas line, 2,000 hp, before FPC.

99 miles, gas, 4,660 hp, $8.9 million, before FPC.

Northern Gas Products Co., (subsidiary of Northern Natural Gas Co.), 350 miles, 8-inch, LPG, Bushton, Kan., to Des Moines, Iowa, $12 million, planned.

Northwestern Refining Co., crude gathering system, Rival and Lignite fields, North Dakota, $625,000, Public Service Commission approval.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Oklahoma Illinois Gas Pipeline Co., (Fish Engineering and Pan American Petroleum Corp.) 550 miles, gas, Woodward, Okla., to St. Louis, planned.

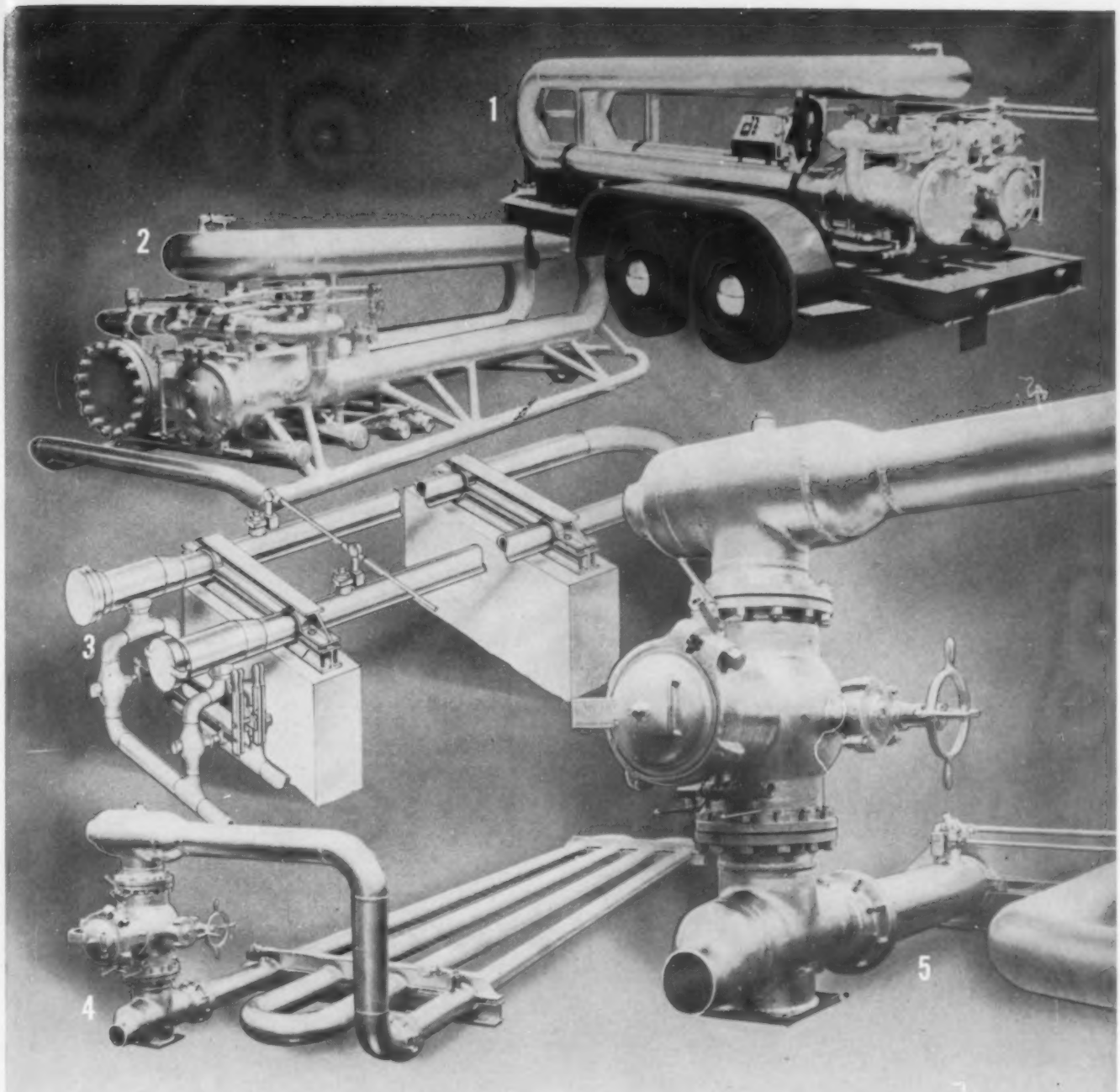
Pacific Gas & Electric Co., San Francisco, 120 miles, 30-inch gas loops, Topock to Milpitas, before FPC.

* **Pacific Lighting Gas Supply Co.,** Los Angeles, 24 miles, 16-inch, gas, Gaviota to Goleta, Calif. $1.7 million, before Public Utilities Commission.

Panhandle Eastern Pipe Line Co., Kansas City, 305 miles, 30-inch, 40 miles, 26-inch, gas, loops, and 43,000 hp, and gathering facilities, $60 million, before FPC.

200 miles, 22-24-inch, gas, lateral, from Elk City, Okla., to Haven, Kan., $15. million, before FPC.

* **Olympic Pipe Line Co.,** 324 miles, 6-16-inch, products, Ferndale, Wash. to Portland, Oregon, $17.5 million, planned.



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4. **Unidirectional, interchange and loop**
5. **Unidirectional, interchange only**

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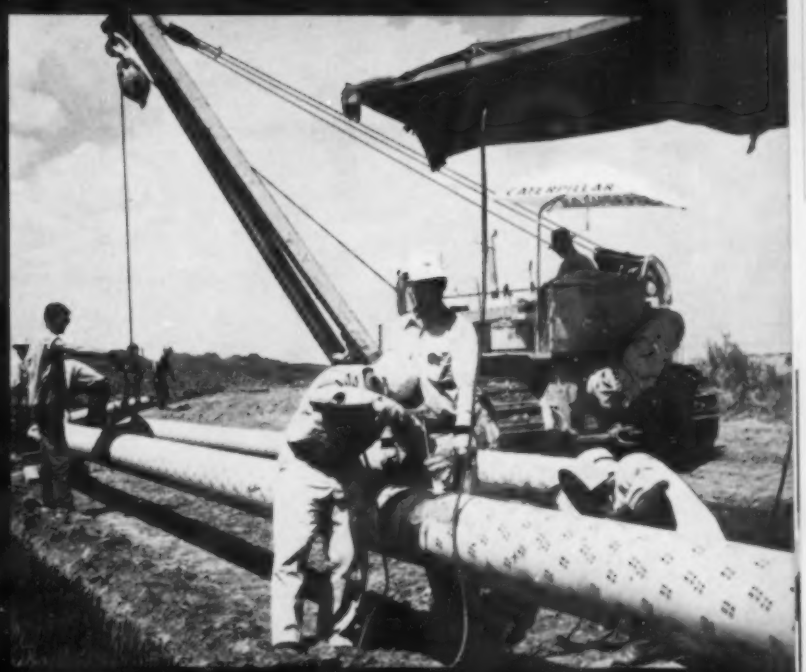

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Jones & Laughlin Supply Division—Tulsa

Pennsylvania Railroad, products pipe lines along railroad's right of way to serve Friendship Airport in Baltimore and Washington's National Airport, Andrews Air Force Base, and Dulles International Airport, considered.

Phillips Pipe Line Co., Bartlesville, Okla., 75 miles, main line, 85 miles, gathering crude, from Camrick field, Gray, Okla., to Phillips, Texas, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 93 miles, 34-inch, California-Nevada border to Newberry, Calif.

St. Lawrence Gas Company, Inc., Ogdensburg, N. Y., 75 miles, gas, main, United States-Canadian border to Ogdensburg, N. Y., $3.4 million, FPC approval.

Suwanee Pipe Line Co., (Sinclair Oil Corp.) Atlanta, 800 miles, 22-inch, products, Baton Rouge to Greensboro, N. C., planned.

Tennessee California Gas Transmission Company, (subsidiary of Tennessee Gas Transmission Co.), 100 miles, 26-inch, gas, gas fields in South Texas to Texas-Mexico border near Reynosa, before FPC.

Tennessee Gas Pipeline Co., Houston 167 miles, 30 and 36-inch loops in Ohio and Pennsylvania, and 36,800 hp in 4 new and 3 existing stations, $38 million, before FPC.

18,300 hp in 3 new stations, $6 million, before FPC.

50 miles, 26-inch loop in Kentucky, FPC authorization.

21 miles, 16-inch, 2 miles, 12-inch, gas, offshore Louisiana, Vermilion blocks 46 and 64, $2.3 million, before FPC.

84 miles, 10-20-inch, gas, offshore Louisiana, FPC authorization.

* **Texas Eastern Transmission Corp.**, Shreveport, La.

66 miles, 30-inch, gas, loops, between Vidor, Texas, and Lambertville, N. J., and 33,710 hp in four existing stations, $17.5 million, temporary FPC authorization.

165 miles, 20-inch, gas, West Monroe, La. to Kosciusko, Miss.; 128 miles, 30-inch, loops, between Kosciusko and Lambertville, N.J., 37 miles, laterals in New Jersey, 51,000 hp, $55.2 million, contracts let to **Bechtel Corp., Western Pipe Line, Inc., Williams Brothers Co.**, and **Houston Contracting Co.**

144 miles, gas, 46,300 hp. $27.8 million, for 1962, before FPC.

Texas Eastman Co., Longview, Texas, 280 miles, 6-inch, products, Houston to Longview, planned.

* **Texas Gas Transmission Corp.**, Owensboro, Ky., 96 miles, 26-30-inch, gas loops, Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana; 50 miles, 8-inch and 16-inch extension into Terrebonne, La. producing area, $16.8 million, FPC temporary authorization, contract let on 30 miles, 30-inch, to **Western Pipe Line, Inc.**

Transcontinental Gas Pipe Line Corporation, Houston.

163 miles, 36-inch, gas, loops, in Louisiana, Alabama, Mississippi, Georgia, North and South Carolina, Virginia, Maryland and Pennsylvania, 10,500 hp, $30 million, before FPC.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

29 miles, 20-inch, gas, and 2,500 hp, in South Texas to take gas from South Texas Natural Gas Gathering Co., $2.4 million, FPC authorization.

Trans-Southern Pipeline Corp., Houston, 1,080 miles, 12-inch, LPG, from Mont Belvieu, Texas, to Danville, Va., and 215-mile spur line from Atlanta to Georgia-Florida border, $63 million, planned.

* **Trunkline Gas Company**, Houston, 97 miles, 30-inch, loops, between Longville, La., and Tuscola, Ill., 27 miles, supply laterals, and two 6,000 horsepower compressor stations, before FPC.

74 miles, 26-inch, gas, Longville to Cow Island, La., 24 miles, 18-inch, Cow Island to Gulf shore, and 24,000 horsepower, $18 million contract to **Panama, Inc.**, and **Sharman, Allen, Gay & Taylor.**

* **United Gas Pipe Line Co.**, Shreveport, La., 59 miles, 36-inch, gas, lateral, between Bastian Bay and Plaquemines Parish, La., $17 million, temporary FPC authorization.

217 miles, 30-inch, gas, Lafayette to Monroe, La., $32 million, contracts let on 156 miles to **Panama, Inc.**, and **Stanley-Bledsoe Corp.**

Utah Gas Pipeline Corp., 200 miles, gas, San Arroya and Bryson Canyon fields to Salt Lake City, $15 million, planned.

Valley Gas Transmission, Inc., Houston, 55 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells counties, Texas, $15 million, before FPC.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. Government.

Ajax Alberta Pipeline Ltd., 28 miles, 10-inch, gas, main, Morinville to Westlock, Alta., planned.

Assistencia de Oleodutos du Petrobras, Rio de Janeiro, 280 miles, 12-inch, crude, Rio de Janeiro to Belo Horizonte, Brazil, planned.

Alberta Gas Products System, Ltd., 725 miles, 8-12 inch, gas liquid gathering system, to connect with Trans Mountain system for delivery to U.S. border, before Alberta Conservation Board.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

* **Britamoil Pipe Line Co. Ltd.**, 64 miles, 8-inch, gas-liquids, Rimbey to Edmonton, Alberta, $2 million, authorized.

British American Oil Co., Ltd., Toronto, 125 miles, gas, Pincher Creek fields to Calgary, Alta., before Alberta Public Utilities Board.

British Columbia Oil Transmission Co., 75 miles, crude, Blueberry field to Taylor, B.C., $8 million, planned.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India. Contract let on 250 miles to Mannesmann-Saipem.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

* **Esso Argentina**, 14-inch, crude, Neuquen to Bahia Blanca, contract let to **Techint. Inc.**

* **Empresa Nacional Calvo Sotelo**, Madrid, Spain, 150 miles, 14-inch, crude, main line, Malaga to Puertollano, Spain, $10 million, planned.

* **Foothills Pipe Lines Ltd.**, 1,300 miles, LPG, from Alberta-Saskatchewan border to Chicago, tie-in with Westalta Products Pipeline proposed system in Alberta, $100 million, permit denied by Alberta Department of Mines and Minerals.

Gas del Estado, Buenos Aires, 1,050 miles, 30-inch, gas, Comodoro Rivadavia field to Buenos Aires, $380 million, bids submitted for design and construction by Texas Eastern Transmission Corp., ENI, and an Argentine firm.

Gas Trunk Line of British Columbia, Vancouver, 250 miles, 30-inch, gas, main, Fort Nelson to Taylor, B. C., planned.

Gasversorgung Sueddeutschland, 180 miles, gas, Mannheim to Karlsruhe to Kehl and Ulm, $20 million, planned.

* **Hudson's Bay Oil & Gas Co. Ltd.**, Calgary, 41 miles, 4-8-inch, condensate, Waterton-Castle River area and Pincher Creek field to Carway to connect with Galcier system, authorized.

Hughenden Pipeline, 125 miles, products, Dick Lake gasoline plant to Hughenden Region, Alta., planned.

* **Hydrocarbons Pipeline, Ltd.**, Winnipeg, Manitoba, 500 miles, 4-12-inch, products, gathering system to Calgary and Interprovincial system, permit denied by Alberta Department of Mines and Minerals.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

International Gas Co., Los Angeles, 1,800-miles, 30-inch, gas, Reynosa to Mexicali at California border, considered.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered, products pipe line, Superior, Wis., to Chicago, considered.

90-mile, crude, Hamilton, Ont., to Buffalo, N. Y., before National Energy Board of Canada.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

S&L

EXTREME LINE CASING

Stewarts and Lloyds introduce their new Extreme Line Casing Joint, manufactured under licence from the Tubular Division of the National Supply Company. It is produced from selected steels to the high standard of workmanship for which Stewarts and Lloyds' casing is renowned. The features of this new product are fully explained in a booklet 'Extreme Line Casing' which is available on request.

Stewarts and Lloyds, who have a hundred years of steel tube making experience, were the first manufacturers in the world to be licensed by the American Petroleum Institute to apply the A.P.I. monogram to their tubular goods. The Company have been supplying casing to the oil industry since the latter part of last century.

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Naphtha Israel Oil Co., 75 miles, 6-inch, gas, Rosh-Zohar field to Ashdod Yam on Mediterranean planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran, $5 million, planned.

Northern Alberta Pipe Lines, Ltd., Edmonton, Alta., 110 miles, 10-inch, gas, main, Lac La Biche to Edmonton, $3 million, planned.

Northern Pipe Line Company, 153 miles, 16-inch, crude, from Regina, Saskatchewan, to Clearbrook, Minn., $10 million, planned.

* **Rhein-Donau Oletung, G.m.b.H**, 185 miles, 24-inch, crude, Karlsruhe to Ingolstadt, $7.5 million, planned.

Peace River Oil Pipe Line Co., Ltd., 161 miles, 12-inch, crude, main line, Fox Creek to Edmonton, Alberta, planned.

Petroleos Mexicanos, 4, 6 and 8-inch, products, Mexico City-Puebla to Cuernavaca, planned.

1,240 miles, 34-inch, gas, Reynosa to Mexicali, Mexico, $160 million, negotiating with Tennessee Gas Pipeline Company for design and construction of the line.

360 mile, 12-inch, products, Minatitlan to Puebla and Mexico City, planned.

Products, Guadalajara to Tepic, planned.

Products, Aguascalientes to Zacatecas, planned.

6-inch, products, Guaymas to Ciudad Obregon, considered.

8-inch products, Guaymas to Hermosillo, considered.

Gas, Ciudad Carmen to Ciudad Pemex.

8-inch, crude Comalcalco to Minatitlan.

Crude, Minatitlan to Salina Cruz, contingent on proposed refinery on Pacific Coast.

149 miles, 10-inch, products, Ciudad Pemex to Minatitlan, planned.

181 miles, 4-inch, products, Mexico City to Salamanca, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, approved.

* **Provincial Pipe Lines, Ltd.**, 700 miles, 3-16-inch, hydrocarbon line gathering system in Alberta, $25 million, permit denied by Alberta Department of Mines and Minerals.

Quebec Gas Transmission Lines, Inc., Montreal, 300 miles, gas, main, Quebec to Montreal, planned.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

* **Royalite Oil Co. Ltd.**, 26 miles 4-inch, products, in Alberta, authorized.

Saskatchewan Power Corp., 179 miles, 4-6-8-inch, gas, planned.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extension to Karlsruhe and Munich, Germany, contract let on Italian portion to Saipem.

Societe du Pipe Line Sud-European, Paris, 432 miles, 34-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Soc. Siciliana Metanadotti, gas line from Hassi R'Mel field in Algeria through Tunisia, across Mediterranean to Sicily and into Italy, considered.

Soc. Trapil, 200 miles, 12-inch, crude, La Havre to Paris, France, planned.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Syrian Pipeline, Damascus, 500 miles, crude, from Karshuk field, Syria, to Mediterranean, planned.

300 miles, products, from Homs to tank farms in Damascus, Aleppo and Latakia, planned.

* **Trinidad and Tabago Electricity Commission**, Trinidad, 42 miles, 16-inch, gas Penel field to Port-of-Spain, planned.

Trunk Pipelines Ltd., London, 70 miles, products, Canvey Island to Denham, Buckinghamshire, bill before Parliament. Extension of line from Denham to Birmingham, planned.

* **Westalta Products Pipeline Ltd.**, 900 miles, LPG, from Northern Alberta to Saskatchewan border, to deliver hydrocarbons to Foothills Pipe Lines, $40 million, permit denied by Alberta Dept. of Mines & Minerals.

* **Yacimientos Petroleos Fiscales Argentina**, Buenos Aires, crude line between Mendoza and Buenos Aires, considered.

Northern Natural Gas Buys Pioneer Gathering

Northern Natural Gas Company has purchased Pioneer Gathering System, Inc., from its parent firm, Pioneer Natural Gas Company. The 133-mile gathering system that Pioneer operated is in West Texas.

Northern formed a new subsidiary to operate the lines—Northern Natural Gas Pipeline Company. W. A. Strauss, president of Northern's gas company, also will be president of the pipe line company.

Petroleum Center Going Up

Construction has been completed on the first phase of the Houston Petroleum Center located at 6001 Gulf Freeway. The $7½ million center will have a total of 350,000 square feet of covered area on 26½ acres of ground when completed.

The first phase includes a single-story U-shaped building with 27,000 square feet of office space. Special services to be offered by various firms are secretarial and phone answering, personnel testing, core testing lab, market research department, freight forwarding agent, currency exchange, multi-lingual translation service and a travel bureau.

Construction will start on phase 2 shortly.

Dial Direct

The middle man (woman) may be eliminated in telephone dialing for inward calls. At Peoples Gas Light and Coke Company in Chicago new facilities make possible direct dialing to the person with whom the caller wishes to speak, without going through the switchboard.

The only trouble with this system is that the caller has to know the individual's number. Peoples Gas employes are mailing cards with their individual number to persons with whom they are in frequent contact.

Contracts for Building Let

Construction of Tennessee Gas Transmission Company's 33 story office building will begin shortly. W. S. Bellows Construction Corp. received contract for excavation and foundation construction. Mosher Steel Co. was named to fabricate and erect the structural steel and H. H. Roberts Co. was awarded contract for the steel decking. The building will have a concrete mat foundation eight feet thick to support the frame.

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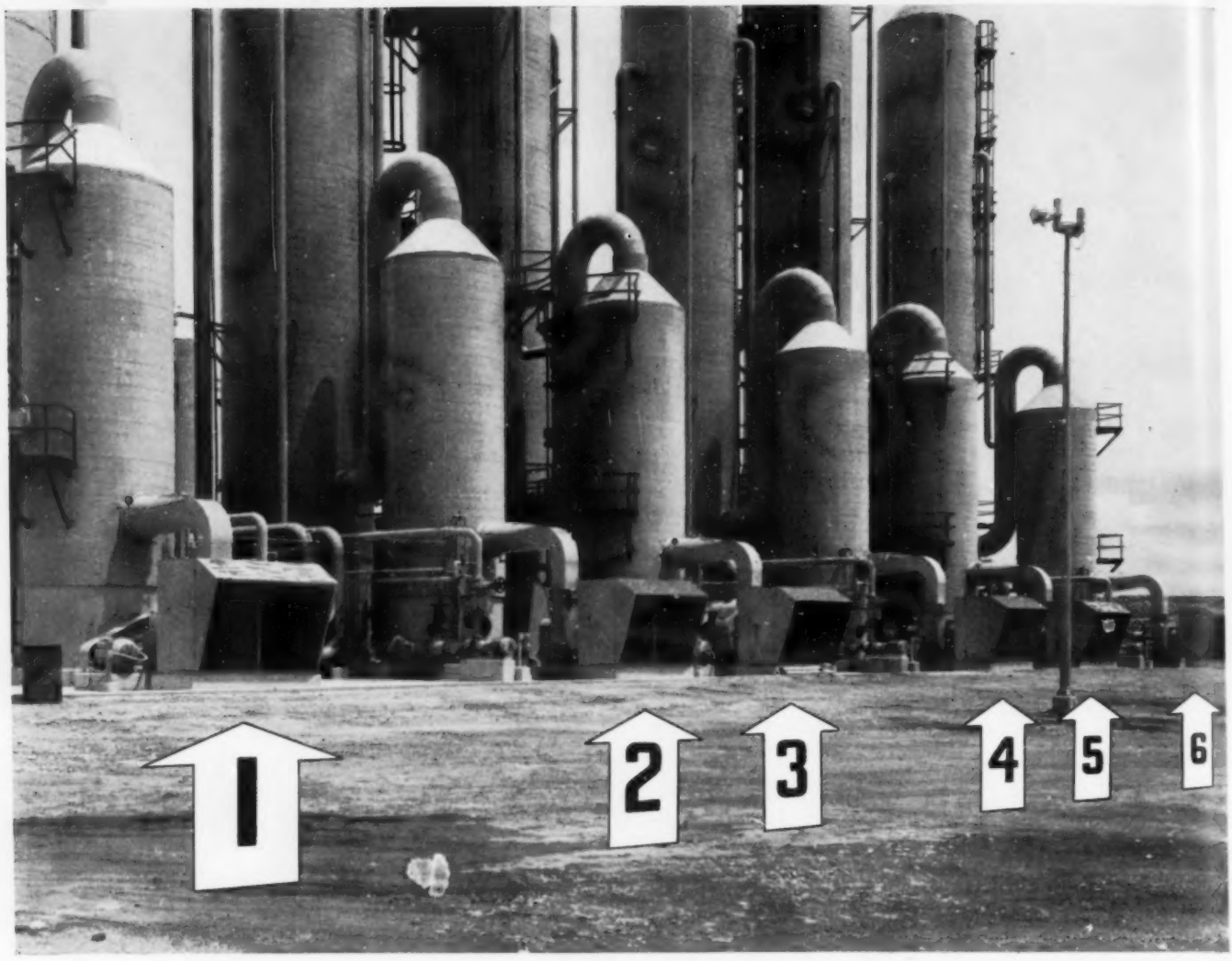

Six "mouths" to feed... each protected by AAF

These giant heat-recovery towers depend on a constant "diet" of *clean air* for efficient, uninterrupted operation. They are part of Transwestern Pipeline Company's new gas-treating plant at Fort Stockton, Texas, where CO_2 is extracted from natural gas.

Banks of AAF PL-24 dry-type unit filters provide the right degree of air cleaning for each tower —day in, day out. The PL-24 is a rugged, all-metal unit which utilizes inexpensive disposable media. The filter's pleated design provides 28½ sq. ft. of media in a face dimension of 2 feet square and a depth of only 8 inches. Initial cost of the PL-24 is low. Replacement media comes in rolls and can be quickly and easily installed in the pleated filter cell at a replacement cost which can be less than 50¢ per unit, depending on the type of media used.

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What's Happening

among MEN in the INDUSTRY

Visiting the United States

Fawzi M. Najm, center, of Beirut, chief safety engineer for Trans-Arabian Pipeline Company, shown at the 14th annual mid-year meeting of the API Safety Committees in Detroit during his first visit to the United States in May. Richard A. Hattrup of Dhaharan, Saudi Arabia, chief fire protection engineer for Arabian American Oil Company, left, and P. N. Taylor, Abqaiq, district safety engineer for Aramco attended the meeting and the same month attended the National Fire Protection Association sessions.

Hoover L. Gibson has been appointed superintendent of design and construction for **Texas Gas Transmission Corporation** and **William B. Threlkeld** has been named assistant corporate secretary. Formerly in charge of compressor engineering, Gibson will handle all design and construction on compressor stations and pipe line facilities. Threlkeld will continue his responsibilities as director of the company's land and lease department.

Hoover L. Gibson

Gibson joined the company in 1948 and became superintendent of compressor department in 1957. Threlkeld has been with the company since 1949.

Three assistant vice presidents have been appointed by **Natural Gas Pipeline Company of America. J. W. Hancock,** general superintendent of exploration, Amarillo; **J. I. Poole,** manager of rates, and **H. R. Rohwedder,** director of operations, have been promoted to the new positions.

Hancock has been with the company since 1935. Poole joined the company in 1952 and Rohwedder has been affiliated with the company since 1930.

N. W. Freeman, president of **Midwestern Gas Transmission Company** and veteran executive with its parent company, **Tennessee Gas Transmission Company,** has retired.

He will remain on the board of directors of Midwestern. **W. C. McGee, Jr.,** president of **Tennessee Gas Pipeline Company,** will assume the presidency in addition to his other duties. Freeman joined TGT in 1943 as manager of personnel department. When Midwestern was formed in 1954, Freeman was named president and a director, as well as senior vice president of TGT.

E. H. Smoker has been nominated to serve as president of the **American Gas Association.** Elections will be held at the AGA convention in Dallas, October 4. Smoker is president of the **United Gas Improvement Co.,** Philadelphia. Currently, he is a vice president of the AGA.

Marvin Chandler, president of **Northern Illinois Gas Company,** was nominated as second vice president and **Charles H. Mann** treasurer **Columbia Gas System, Inc.,** was renominated as treasurer.

Lester T. Potter, president of **Lone Star Gas Company,** and president of AGA, will serve a one-year term as a member of the board.

Sinclair Pipe Line Company named **R. O. Landrith,** manager purchasing department, succeeding **G. O. Ash,** who retired.

Landrith had been assistant manager. He began his Sinclair service with a predecessor company in 1924.

Robert R. Park has been appointed manager of gas market research for **Texas Eastern Transmission Corporation.** He will have responsibility for carrying out market research programs in the Appalachian and Eastern Seaboard area served by the company. His headquarters will be in Shreveport.

Prior to his appointment, he had been analyst in the coordinating and planning department in Houston.

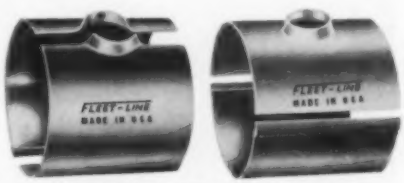
FLEET-LINE
WELDING FITTINGS

LITERATURE BY Air Mail

Code fittings; domestic materials. All orders acknowledged by airmail or long distance phone and filled at once.

REDUCERS: Concentric and Eccentric, 1" through 30". ASA B16.9, ASTM A234. Schedules 10 to 160, X and XX heavy, stainless steel, chrome-moly and other alloys, genuine wrought iron, copper, aluminum. Special lengths and sizes without delay.

SADDLES, conventional, and for pressure vessel heads Nozzle sizes from ¼" through 24" with skirts to any size. FLEET-LINE saddles weld neatly into place in much less time and with much less melding rod.



FULL-ENCIRCLEMENT SADDLES, nominal pipe sizes 2" through 36". Five types.

REDUCING TEES, Forged Steel, 8" through 30".

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for Peoples Natural Gas

The Peoples Natural Gas Company safeguards service to its 265,000 residential and industrial customers with a supervisory control system designed to be the most secure in the gas distribution industry. Every component in this Bristol engineered digital system was specified and built for reliability and operating efficiency.

From a central dispatching office in Pittsburgh's Gateway Center, dispatchers receive a continuously displayed digital description of flow, pressure, and temperature conditions at the system's five major metering and regulating stations. At timed intervals or on demand, all data is also permanently recorded by an automatic logger on typewritten log sheets.

Control signals are selected digitally, subjected to a series of automatic security checks and transmitted via Westinghouse digital facilities and Bristol controllers to the proper regulators. Alarm contacts provided on the remote controllers can also be reset from the central station, facilitating adjustment to varying load conditions.

For detailed information about Bristol system engineering or for assistance with your specific telemetering or control problem, write:

ACCO

The Bristol Company, 114 Bristol Road, Waterbury 20, Connecticut.

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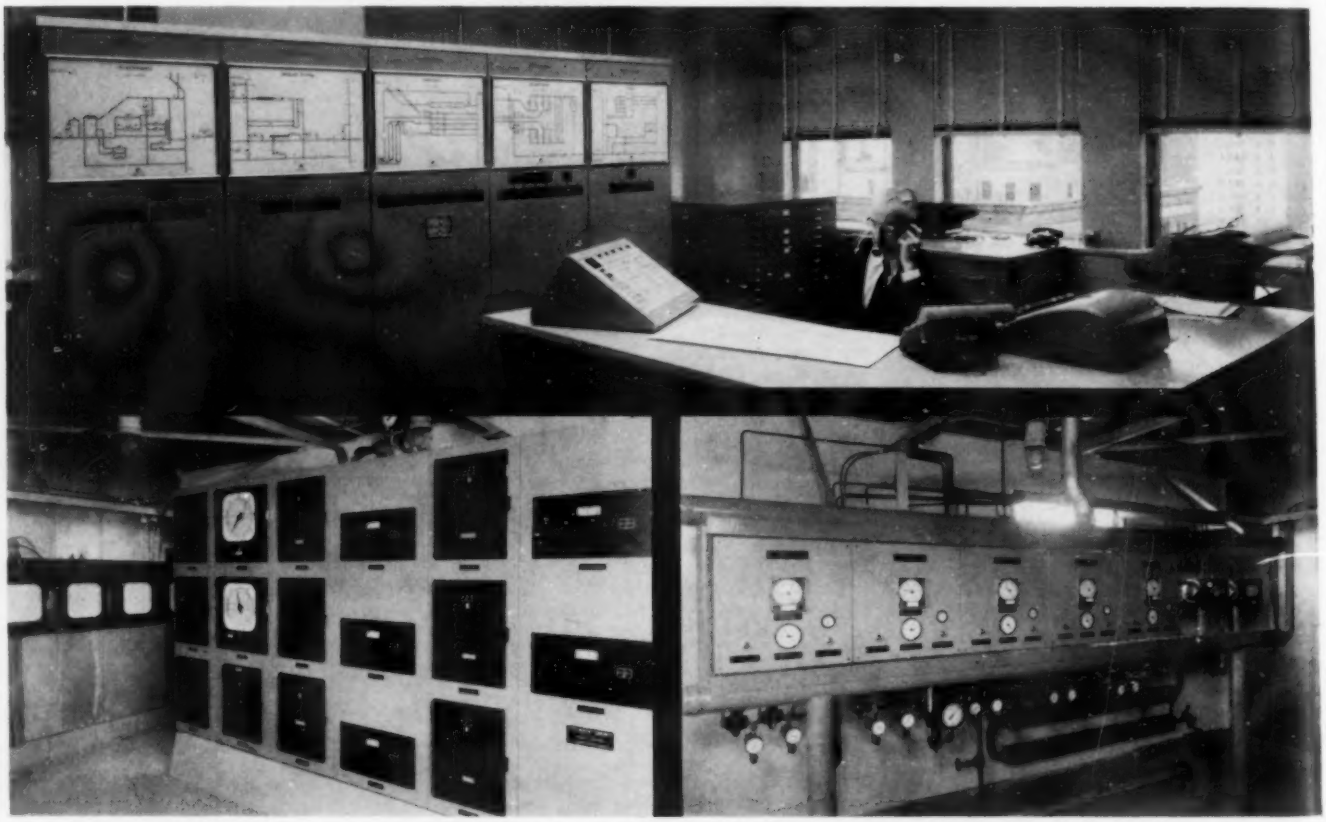
Upper Photo: Central station readout is provided by digital indicators on the schematic panels at left and on typewritten sheets from the data logger at far right. Control signals are telemetered digitally from the operator's console shown in center of picture.



Lower Left Photo: Metering and regulating station variables are monitored by Bristol gas flow computers and Dyna-Servo static pressure, temperature and differential pressure transducers. Use of conventional pneumatic controllers and diaphram valves is made possible by Dynamaster® digital-to-analog transducers (at center and right of panel) which convert the telemetered binary bit signals into pneumatic regulator set points. **Lower Right Photo:** These Bristol Metagraphic controllers operate pneumatic regulator valves through conventional 3-15 psi control signals. All valve positions are controlled by digital commands from the central dispatch office.

®Reg. T. M., U. S. Pat. Off.

BRISTOL . . . leader in instrumentation for the gas industry

AUTOMATIC CONTROLLING, RECORDING, LOGGING AND TELEMETERING INSTRUMENTS

Natural Gas Pipeline Company of America has announced several key appointments. **J. W. Kirstein,** field superintendent of pipe lines at Beatrice, Neb., becomes general superintendent of construction division in Chicago. This is a newly created position. Kirstein is replaced by **E. C. McCann,** assistant field superintendent of gathering lines in Fritch, Texas.

J. W. Kirstein

W. C. Gibson, district superintendent of storage, **Natural Gas Storage Company of Illinois,** was named assistant superintendent at Fritch. **C. A. Arthur,** district superintendent, Oklahoma extension at Bridgeport, Texas, succeeds Gibson and **J. B. DeLille,** district superintendent, Minneola, Kansas, replaces Arthur. DeLille is succeeded by **M. R. Poulain,** formerly district engineer at Minneola, Kansas.

Pacific Gas and Electric Company has announced three executive appointments. **O. R. Doerr,** vice president-sales, was promoted to vice president and assistant to the company's general manager. **R. W. Joyce** was elected to the new position of vice president in charge of commercial operations and **W. D. Howell** was named general sales manager.

Joyce joined the company in 1947 and became manager of commercial department in 1954. Howell has been with PG&E since 1926 and has served as manager of commercial, industrial and agricultural sales since 1958. Doerr joined PG&E sales department in 1930 and became a vice president in 1948.

William C. Marris has been elected vice president in charge of rates and economics for **Panhandle Eastern Pipe Line Company.** Marris joined Panhandle in 1954 as assistant to the controller. He became manager of economics in 1959 and was made director of rates and economics in 1960.

Trans-Canada Pipe Lines Limited announces the election of five members to its board of directors. Directors include **N. J. McKinnon,** president and chief executive officer of Canadian Imperial Bank of Commerce, Toronto; **Beverley Matthews,** C.B.E., Q.C., senior partner in law firm of McCarthy & McCarthy, Toronto; and **V. W. T. Scully,** C.M.G., F.C.A., president and chief executive officer of the Steel Company of Canada, Limited, Hamilton, Ontario. Others appointed are **R. W. Campbell,** vice president and general manager of Home Oil Limited, Calgary, Alberta, and **E. L. Kennedy,** partner of Lehman Brothers, New York investment bankers.

Deaths

Frederick Stueck, 55, member of the Federal Power Commission, died July 15 at his home in Washington.

Stueck had been a commissioner since 1954. He was reappointed in 1959 and his present term would have expired in June, 1964.

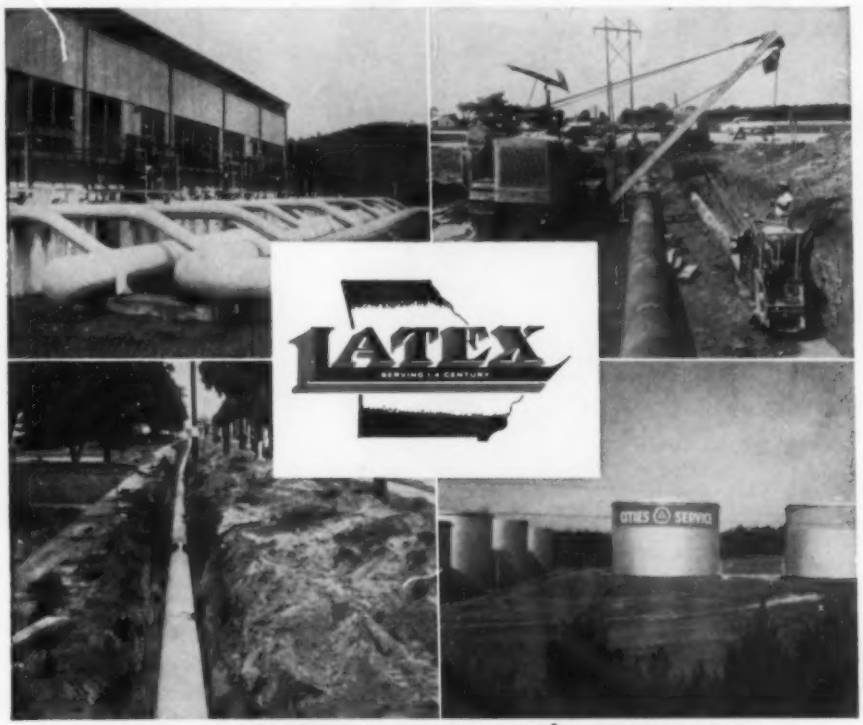
Robert Adams, El Paso Natural Gas Company, director of public relations, was killed in an airplane accident, June 27. The plane was flying over the Pacific Ocean near LaPush, Washington, and struck a power cable, between LaPush and a small island.

Four others killed in the accident included **Don Cornwell** of El Paso Natural Gas; **Ed Koterba,** Scripps-Howard newspaper; **Ned Trimble,** Kansas City Star newspaper; and **E. G. Hines,** vice president of Bozell and Jacobs, Inc.

Leslie T. Fournier, 59, vice president and treasurer of Panhandle Eastern Pipe Line Company, died of a heart attack, July 5, at home in Ridgewood, N.J.

He had been with Panhandle since 1946 and in 1950 was named treasurer.

Frank B. Wright, 69, former vice president of Southern Counties Gas Co., died June 17, in Cedar Falls, Iowa. Cause of death was a heart disease. Wright retired from the company in 1960. He served as vice president in charge of public relations, customers department and division coordinator. He joined the company in 1912.



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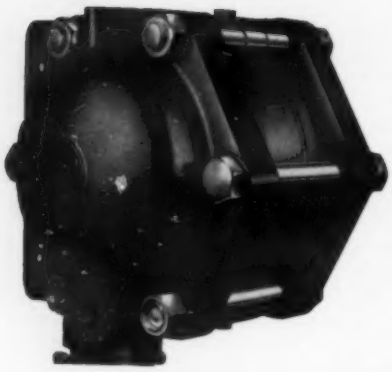
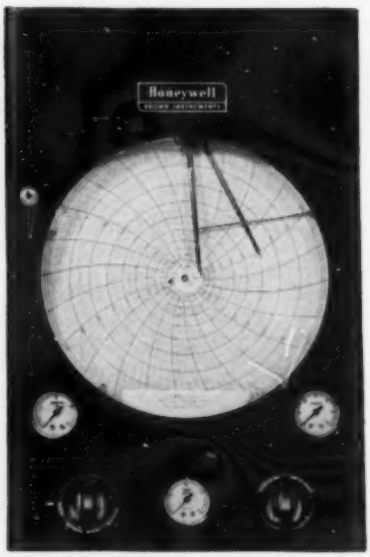
For more data on advertised products, use cards, last page.



Honeywell Bellows Meter brings

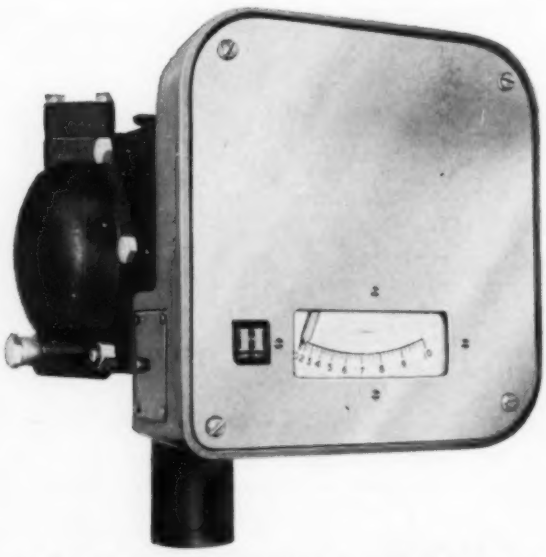
Six of many ways you can use the bellows meter

As a Recorder or Integrator—Recorders can have one, two or three pens, with the second and third pens actuated by thermometer or pressure elements. A single-pen recorder is shown above. You can get integration, too.
Write for Specification S 292-2a.



As Recording Controllers—You can get recorders with pneumatic ON-OFF, 10% *Throttlor*, 150% *Throttlor* with manual reset, or *Air-O-Line* (150% proportional band-plus-automatic reset) control. A single-pen pneumatic controller with integral bypass is shown above.
Write for Specification S 292-2a.

As a Non-indicating Pneumatic Transmitter—Use this non-indicating transmitter when you don't need indication at the point of measurement, and when the measured variable is to be transmitted to remotely located instruments.
Write for Specification S 230-1.



As an Electric Transmitter—You can use this *ElectriK Tel-O-Set* electric flow and liquid level transmitter with indicators, recorders, and controllers, with data handling systems, or with millivolt receivers. Field indication, as shown, is optionally available.
Write for Specification FS 301-7.

new versatility to flow or liquid level measurement

As an Indicating Pneumatic Transmitter—Gives you indication at the point of measurement, plus pneumatic transmission. Easy-to-read scale, and large indicating pointer. Case is only 4 by 7 by 9 inches.
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As a Dial Indicator—Six-inch dial indicator gives easy, accurate readings at point of measurement. This meter-indicator is designed specifically for field indication.
Write for Specification S 224-1.

You can use the Honeywell Bellows Flow Meter as a recorder, controller, indicator or transmitter . . . pneumatic or electric. Use it for accurate, low-maintenance metering of flow—for steam, water, gas, oil or other fluids—or for liquid level measurement. In all of its many forms, with all of its performance advantages and operating economy, it is the most advanced flow and liquid level meter available today.

Some outstanding features:

Stability—The meter body will operate over an ambient temperature range of —40° to 250°F. Over a range from —32° to 150°F. the accuracy will not change more than 0.5%.

Leakproof construction—Hydraulically formed stainless steel bellows eliminate any chance of leakage between fill and process fluid.

Quick, easy damping—Rectangular orifice pulsation check varies the speed of response over a ratio of 20 to 1. Adjustment is essentially linear and can be made from outside the meter body while the instrument is operating.

Sensitivity and accuracy are well within the required limits of measurement and control on applications for which these instruments were designed.

Convenience—Change range easily in the field by replacing a single range spring assembly. The meter body is self-venting when measuring liquids and installed below the flow line; self-draining when measuring gas and installed above the flow line.

There are models of the Honeywell Bellows Flow Meter available in many ranges, for every application. Your nearby Honeywell field engineer can give you complete details and help you select the correct model for your application. Call him today.

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These pipeliners are cutting costs – using SIE control systems

DISPATCHERS CONSOLE used by Cherokee Pipe Line Company for automatic control of liquid line.

SIEMARC Supervisory Systems provide automatic monitoring and remote control for many industrial operations and processes including the petroleum installation pictured. Measuring, data gathering, telemetering, logging, display, indicating and computing are all integrated in the system. Both solid-state and relay components are used as dictated by proper engineering design. Transistors and semiconductor diodes are utilized in all high-speed switching and logic circuits including encoders, decoders, analog-to-digital converters, deviation detectors and magnetic drum circuitry. Separate electric logging typewriters record data and alarms.

POWER LEVEL CONTROLLER used by Shell Pipe Line Corp. Ozark System for maximum pumping station operating economy.

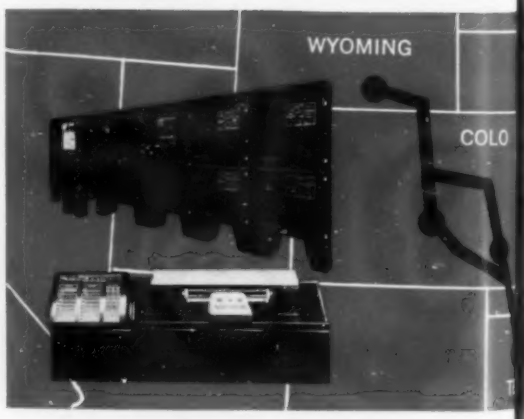
Completely unattended operation of a multi-unit pumping station is possible with Power Level Controllers used by Shell Pipe Line Corp. The unit accepts signals from flow and pressure pickups and makes logic decisions to bring proper combinations of pump units on or off stream automatically. It may be connected to the supervisory control system to permit reset of power levels from a central office dispatching console.

COMPRESSOR STATION CONTROL CONSOLE including complete engine control equipment for automatic station operation and safety.

For gas transmission automation, the basic SIEMARC system can be coupled with Log-Alarm Shutdown and Engine Control-Sequence units. Building block design throughout allows SIE to fit your needs exactly.

DISPATCH PANEL used by Colorado Interstate Gas Company.

In the Colorado Interstate Gas Company installation shown, dispatchers transmit only desired discharge pressure settings; automation at each compressor station responds by maintaining the selected value for optimum station economy. If communication links fail, local automation operates without interruption. Log-Alarm units insure station safety. Dispatchers are alerted only when trouble occurs.



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WHO'S MEETING WHERE

August

Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., August 28-30.

September

ISA, Fall Instrument-Automation conference and exhibit, Biltmore Hotel, Memorial Sports Arena, Los Angeles, September 11-15.

AGA, SGA, annual accident prevention conference, Statler Hilton Hotel, Dallas, September 12-13.

Mid-Continent Oil & Gas Association, Louisiana-Arkansas Division, 39th annual membership meeting, Roosevelt Hotel, New Orleans, Sept. 13-15.

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J., September 13-15.

Pacific Coast Gas Association, convention and annual meeting, Coronado Hotel, Coronado, Calif., September 13-15.

NGAA, Rocky Mountain Regional meeting, Northern Hotel, Billings, Mont., September 14.

AIEE, petroleum industry conference, New Orleans, September 17-20.

INGAA, annual meeting, Shamrock Hilton Hotel, Houston, September 18-19.

American Welding Society, fall meeting, Adolphus Hotel, Dallas, September 25-28.

NACE, Central Oklahoma Section, corrosion short course, University of Oklahoma, Norman, Okla., September 27-29.

ASME, petroleum division conference, Muehlebach Hotel, Kansas City, September 24-27.

October

AGA, 43rd annual convention, Statler Hilton Hotel and Municipal Auditorium, Dallas, October 1-4.

University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kansas, October 3-4.

NACE, Western Region Conference, Hotel Multnomah, Portland, Ore., October 4-6.

NACE, North Central Region Conference, Chase Park Plaza Hotel, St. Louis, October 9-11.

California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif., October 12-13.

ASME-ASLE, lubrication conference, Morrison Hotel, Chicago, October 17-19.

Rocky Mountain Oil & Gas Association, annual convention, Denver-Hilton Hotel, Denver, October 18-20.

NOW...THERE'S A NEW WAY TO GROUT COMPRESSORS!

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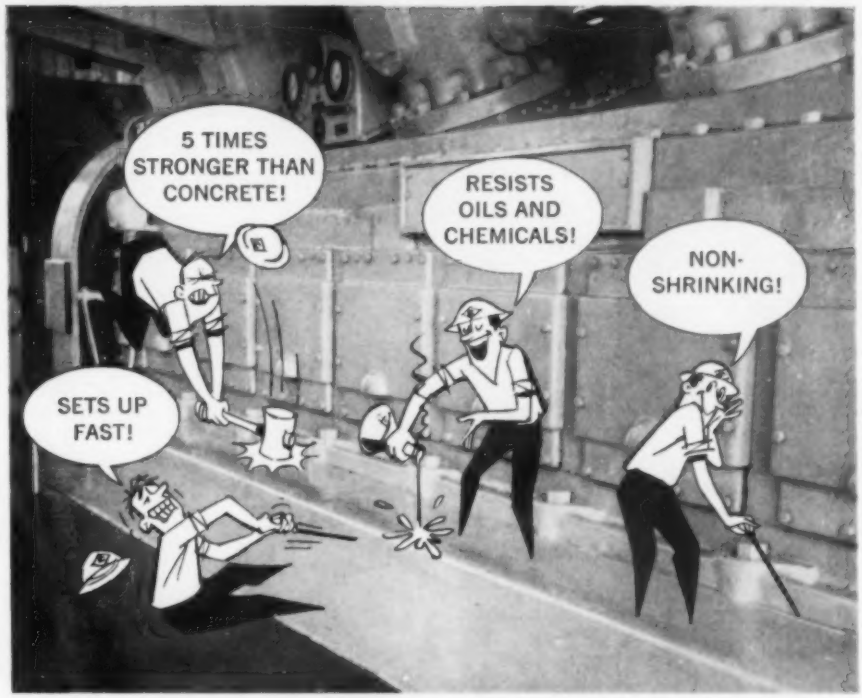

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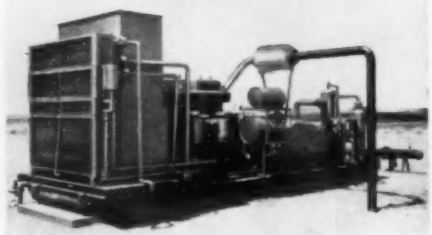
COMPRESSOR POWER

Waukesha 1197 cu. in. engine driving packaged gas booster unit—Oklahoma



Waukesha 3520 cu. in. engine on heavy duty compressor application—Texas

All the proven features that insure long engine life and the ability to withstand overloads, and that result in low maintenance costs and economical operation, are built into these Waukesha engines . . . from precision-counterbalanced rugged crankshafts; pistons, rings, and rod and pin assemblies in matched sets, to built-in automatically lubricated governors and big capacity cooling and oiling systems. The line is complete; you can get exactly the right power for your needs. You can't buy better engines for continuous heavy duty compressor operation.

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Factories: Waukesha, Wis., and Clinton, Iowa

What's Happening among SERVICE and SUPPLY MEN

Robert L. Toney

Cris Matthews

Cathodic Protection Service Appoints Two Branch Managers

Cathodic Protection Service has named two branch managers and a sales engineer. Robert L. Toney will head the new Los Angeles branch office and John R. Vrable will manage the Pittsburgh, Pa. office. Cris Matthews joins the firm as a corrosion engineer in the Tulsa office.

John R. Vrable

Toney, who had served with Polyken Division of Kendall Company, will represent both sales and service divisions of CPS. Vrable has been with New York State Natural Gas Corporation for ten years, five as chief corrosion engineer. Matthews had been with Midwestern Pipe Line Products Company. He also spent four years on corrosion engineering staff of Phillips Pipe Line Company.

Alco Products, Inc. Appoints Miller Executive Vice President

William G. Miller has been elected executive vice president of Alco Products, Inc. He has been vice president in charge of thermal and petroleum industry equipment groups since 1960. He became a director in 1959.

Texas Instruments-CPS Sign Distributorship Agreement

A distributor sales and service agreement for thermoelectric generators for cathodic protection applications has been signed by Texas Instruments Incorporated and Cathodic Protection Service. Texas Instruments developed the new generators which are designed for remote, unattended installations.

Albert & Harlow, Inc. Names W. T. Price Vice President

William T. Price has been named vice president and general parts and service manager for Albert & Harlow, Inc., Caterpillar dealers for Eastern Oklahoma.

Price joined the company after serving 19 years as Caterpillar service representative.

Anchor-Wate Announces Managerial Appointments

J. M. Rogers, general manager of Anchor-Wate, Inc., has been named vice president in charge of production for Anchor-Wate, Inc. and Anchor-Wate Co. Also he will serve as general manager for the Anchor-Wate Equipment Co.

R. G. Groove, formerly general manager of the Hi-Stress division of Anchor-Wate Co. has been elected vice president in charge of engineering, sales, planning research, and purchasing.

Texsteam Corporation Acquires Accessory Products Company Line

Texsteam Corporation has acquired the natural gas equipment line of Accessory Products Company and will transfer manufacturing from APCO's Whittier, Calif., plant to Houston. The line includes the Jet-Stream pressure reducing regulator and Check Steam dump valve.

As part of the acquisition, Texsteam will absorb a part of the current APCO sales organization. No facilities expansion is planned at this time.

Wheeler Promotes Inverso to Application Engineering Staff

Anthony W. Inverso has been promoted by C. H. Wheeler Manufacturing Company to the application engineering staff of the company's condenser and pump sales department.

Inverso joined the company in 1952 and was a member of the engineering department.

Koehring Names Cunningham Sales Development Manager

Philip E. Cunningham has been appointed sales development manager for Koehring Division of Koehring Company. He had been product sales manager in charge of crane-excavators. Cunningham joined the company in 1936 while attending Marquette University.

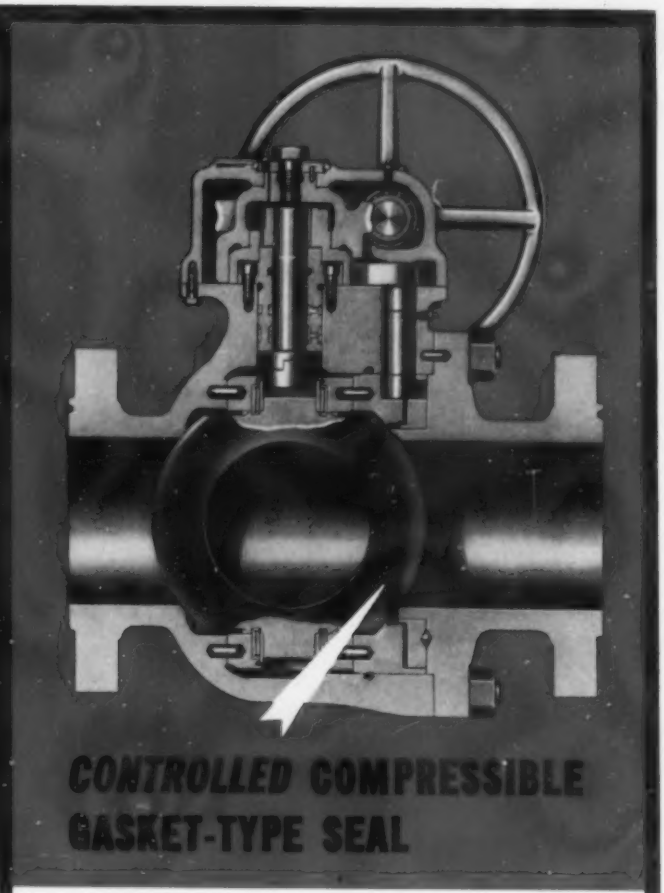
Cook Paint & Varnish Names Arnold Southern Division Head

Robert H. Arnold has been named resident manager of Cook Paint & Varnish Company's Southern Division. Donald E. Lewis was promoted to manager of Cook's Wallpaper Operations replacing Arnold. Arnold has been with the company since 1948 and Lewis joined the firm in 1946.

Southern Pipe Appoints Colesworthy Sales Manager

Southern Pipe, Division of U. S. Industries, Inc., has named Charles F. Colesworthy general sales manager. Previously he served with American Pipe in sales and marketing capacity.

Xtra benefits from full-opening HYDRIL Ball Plug Valves!



Now with worm-gear drive, Hydril Ball Plug Valves are even easier to operate... less torque on the handwheel is required than in other worm-gear valve drives. The ball plug is mounted on sealed bearings to further assure easy operation. Gear mechanism is completely enclosed for protection from weather and other damage. Optional power operators (pneumatic, hydraulic or electric) are available. Also available are the standard Hydril Ball Plug Valves with spur-gear drive. Both in a wide range of sizes and pressure ratings.

Like the gasket seal in a tongue-and-groove flange, the fully confined Hydril seal ring *does not rely on line pressure*... it is *mechanically compressed* against the plug to form a completely bubble-tight high-pressure seal in either direction. On opening the valve, this seal is relaxed from contact with the plug before it is turned. Friction and drag are minimized, assuring long life and low maintenance. Hydril Valves are fully field-tested and proven in a wide variety of services. See your Hydril representative, or write for new catalog.

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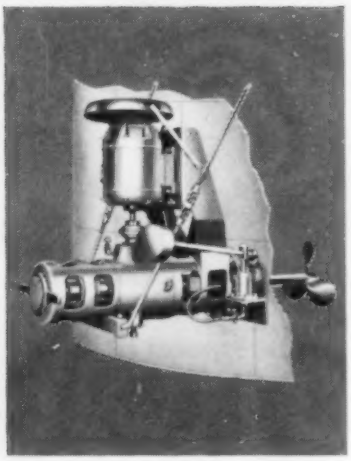
HYDRIL SUPPLY COMPANY: Harvey, Lafayette, New Iberia, Shreveport, Louisiana; Oklahoma City, Tulsa, Oklahoma; Casper, Wyoming.

HYDRIL CANADIAN COMPANY, LTD.: Calgary, Edmonton, Alberta.

For more data on advertised products, use cards, last page.

NEW



for sediment control

Beginning today, all other side-entering mixers are out of date. ¶ The LIGHTNIN Mixer you see here is a 50-horsepower Hi-Flo unit. It does the work of *three* 25-hp mixers on a big blending tank. ¶ It saves you one-half the purchase price of three 25-hp mixers • almost two-thirds the installation cost • and one-third of the operating cost. ¶ You can now get LIGHTNIN Mixers like it in a *full range of sizes up to 50 hp.* This new line provides 50% more flow per horsepower than any other side-entering mixer. It is called LIGHTNIN Series NSE. ¶ At every size level, these units equipped with new Super-Pitch propellers provide extra pumping capacity. Capacity that translates into better sediment control, or sediment control at lower installed cost. ¶ For information, call your LIGHTNIN Mixer representative now. He's listed in Refinery Catalog and in the yellow pages of your telephone directory. Or write, wire, phone us direct for Bulletin B-526.

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MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 196-h Mt. Read Blvd., Rochester 3, N.Y.

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In Europe: Lightnin Mixers, Ltd., Poynton, Cheshire, England

J. E. McCarthy

James D. Gilbride

Clark Bros. Co. Appoints California District Manager

Clark Bros. Co. has appointed James D. Gilbride California District manager with headquarters in Los Angeles. J. Eugene McCarthy was named Canadian district manager with offices in Calgary, Alta., and John Pyles becomes Toronto branch manager, for Clark Compressor Co. Ltd.

Gilbride came to Clark in 1949 as an engineer in the technical service department. He joined Clark Compressor in 1957 and became Canadian manager. McCarthy has been with the company since 1946 and succeeds Gilbride in Canada. Pyles has been with Clark Compressor since 1957 and Clark Bros. since 1953.

James Gore Promoted by Pittsburgh Chemical Co.

James Gore III, has been promoted to manager-administration production and tar sales for the protective coatings division of Pittsburgh Chemical Company.

James Gore III

Formerly Gore was production and planning coordinator for the division. He joined the parent firm Pittsburgh Coke & Chemical Company, as technical director of the phthalic anhydride plant in 1950. He also has served as supervisor of process development and as division superintendent.

Bazaco Appointed Field Sales Manager for Fischer & Porter

Fischer & Porter Co. has named George Bazaco field sales manager and appointed O. A. Seglem field administrator. Bazaco had been the company's petroleum industry manager and Seglem was manager of the Ohio Valley sales region.

Madden T. Works Appointed Hydromatics Chief Engineer

Madden T. Works has been appointed chief engineer for the production of Flo-Ball valves for military and industrial applications by Hydromatics, Inc. Works has been in the valve engineering, production and oil field industry for 30 years.

Madden T. Works

Prior to joining Hydromatics, Works was associated with Turbodrill Division of Dresser Industries, Inc. He served 22 years with Cameron Iron Works starting as a draftsman and field service man in 1932.

Stupp Corporation Names Dee G. Jones Representative

Dee G. Jones has been appointed sales representative for Stupp Corporation in the Dallas area.

He comes to Stupp from a position as division sales engineer with an oilfield supply company.

Bucyrus-Erie Co. Names Winter Production Manager

William B. Winter has been appointed manager of production planning and control at South Milwaukee Works for Bucyrus-Erie Co. Formerly he was general foreman—plate and weld, and previously served as quality control manager.

David R. Davis Joins Charles Wheatley Co.

David R. Davis has joined Charles Wheatley Co., as coordinator of sales, advertising, and pricing. Davis has been associated with the valve industry for the past 25 years.

Ralph N. Brodie Company Completes New Chicago Office

Ralph N. Brodie has completed a new headquarters and meter and valve service center for the Middle West. Facilities are located at 801 Circle Avenue, Forest Park, Ill.

The 6,350 square foot structure is fully occupied by all departments.

How to control pipeline corrosion for $0.0011 per barrel

As a pipeline operator, you know what internal corrosion of the line can mean in reduced lifetime, decreased throughput, frequent scraper runs, premature replacement of filters, meters and valves – as well as product contamination.

Du Pont RP-2, an oil-soluble corrosion inhibitor, effectively reduces such corrosion and the problems it causes. Added at the refinery or pipeline, Du Pont RP-2 forms a protective film on the inside of the pipe. This film creates an effective barrier against the dissolved or entrained oxygen and water in the piped distillate.

Such protection is possible with an average dosage of only 2 pounds of RP-2 per 1000 barrels of product – $0.0011 per barrel. The additive is readily available throughout the United States.

Complete details are contained in our Tech Memo, "Du Pont RP-2 as a Pipeline Corrosion Inhibitor". For your free copy, write: E. I. du Pont de Nemours & Co. (Inc.), Petroleum Chemicals Div., Room 7450 Nemours Bldg., Wilmington 98, Del.

Lead Antiknock Compounds and other Petroleum Additives

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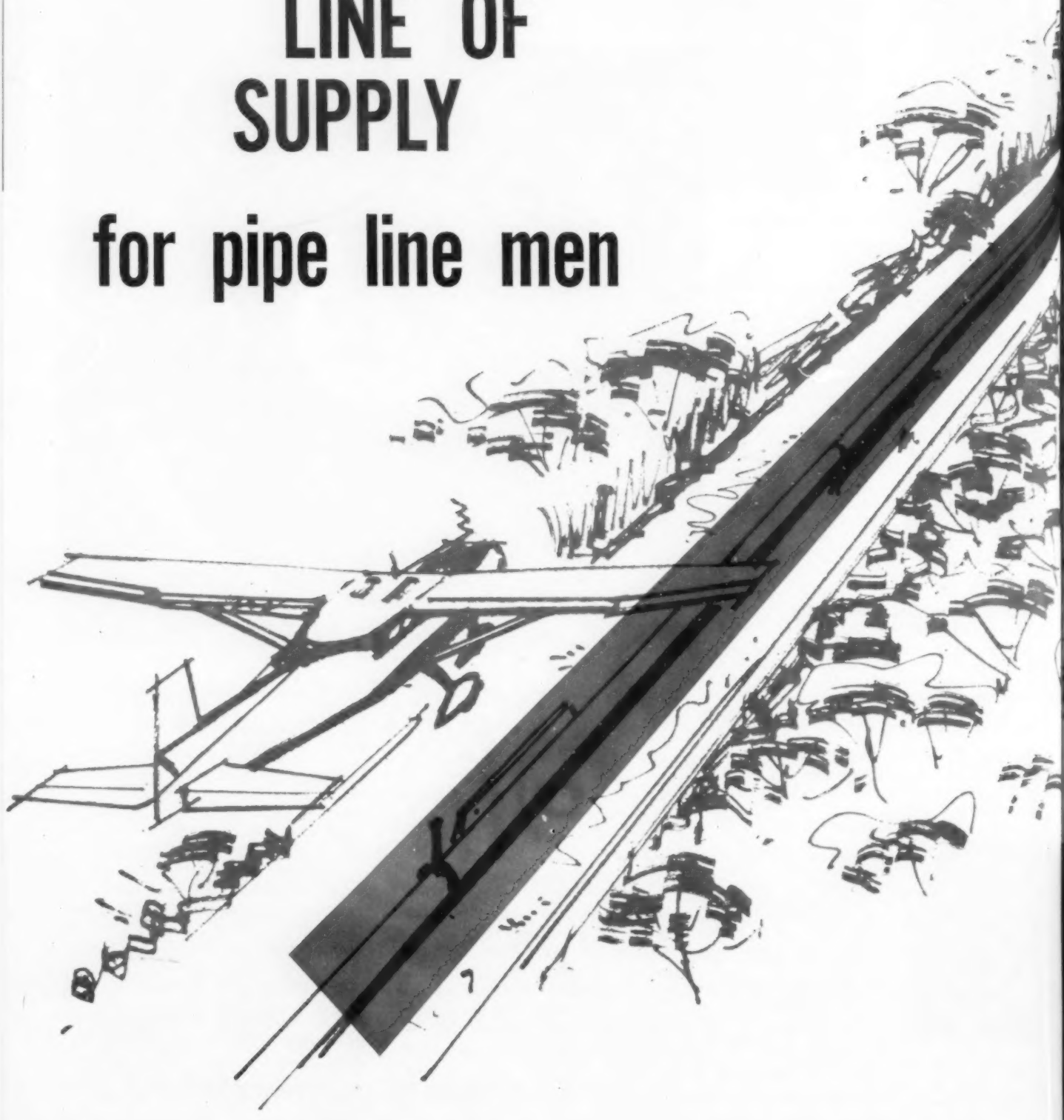
Better Things for Better Living . . . through Chemistry

For more data on advertised products, use cards, last page.

THE STRAIGHTEST LINE OF SUPPLY

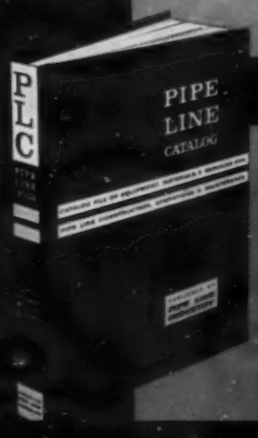
for pipe line men



If you buy for the pipe line industry, you don't need to maintain an elaborate, bulky file of suppliers' literature. Simply keep at hand your copy of PIPE LINE CATALOG . . . the shortest, most efficient pipe line between you and pipe line equipment, materials and services.

Hundreds of manufacturers, suppliers and service companies file complete or condensed catalogs in PIPE LINE CATALOG . . . many publish no other catalog. If you use the catalog for your buying, you take advantage of a convenient, up-to-date, one-volume, reference. You have constantly available complete information and comparative data on thousands of products and services.

The next time you buy or specify, save time and effort – and money – by going through PIPE LINE CATALOG . . . your *straightest line of supply!*



PIPE LINE CATALOG

Published by PIPE LINE INDUSTRY

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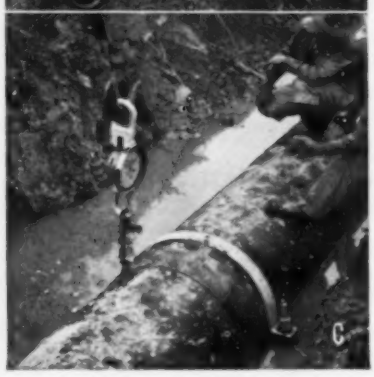
NOW—Complete Anchoring Service

- ENGINEERING
- TESTING
- INSTALLATION

Use the Chance Field Service Plan . . . the surest, easiest, most reliable, and least expensive way to anchor pipelines. You'll cut costs about 85% by using Chance Screw Anchors and tie-down brackets. And, you can have the whole project engineered, installed, and tested by qualified technicians at far less cost than counter weighting.

Chance application engineers will conduct soil test probes (photos A & B) to determine where anchors should be installed, the size anchors needed, and the proper anchoring depth. Pull tests (photo C) will verify their recommendations. Then, for a reasonable fee, Chance will provide special installation equipment, and the services of an installation supervisor.



Here's one job you can leave to *Chance!* You'll save money, too, because Chance Anchors cost much less than counter weights. And, they're lighter and less bulky than counter weights . . . cheaper to transport, easier to store. A complete unit (two anchors and one bracket) weighs from 29 to 180 pounds, and will hold 5,000 to 30,000 pounds.

Call or write for complete information on the Chance Field Service Plan.

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Petroleum Equipment Engineering and Services Division of

A. B. CHANCE CO.

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INTERNATIONAL DIVISION • CENTRALIA, MO., U. S. A.

Louis G. Good Forms Instrument Sales Co.

Louis G. Good, formerly vice president with Panellit Service Corp., has formed System Service Corporation in Charlotte, N.C. The firm will represent eight instrument product lines in the Carolinas and Southern Virginia. Principals represented include Mason-Neilan, Annin Co., De/Var, Panalarm, Powertron-Ultrasonics, Daystrom-Weston, Barton Instruments, and Meriam.

William B. Simons is vice president and James Nisbet secretary and treasurer. Both are owners of Mec-Tric Control Company and Carolina Controls.

Crane Co. Acquires Midwest Piping Co.

Midwest Piping Company has been purchased by Crane Co., and will be operated as a division of Crane.

Midwest was founded in 1896 as Urbauer-Atwood Company.

Tube-Kote, Inc. Plans Midland Plant Expansion

Tube-Kote, Inc., is expanding its Midland plant which will provide facilities to double production capacity. The $250,000 program will be completed by October.

Michigan Seamless Tube Co. Names Zywiec Chief Engineer

Michigan Seamless Tube Co. has named E. A. Zywiec chief engineer succeeding L. E. Robinson who has retired. Robinson will continue with the company as a consultant. Zywiec has been Robinson's assistant since 1955.

Shand and Jurs Company Names Vincent J. Salemme Chief Engineer

Shand and Jurs Company has named Vincent J. Salemme to fill the new position of chief engineer for all engineering operations. Salemme has 17 years experience in electro-mechanical engineering.

Write for Bulletin

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.

P. O. BOX 276-K
SHREVEPORT
LOUISIANA

fleet service for Walworth LPV's

Walworth's own fleet of service wagons is on call around the clock. Each of these self-contained, highly mobile service units is fully outfitted with specially-designed equipment to perform routine and special lubricated plug valve service . . . at the job site. Back country and rough terrain are all part of the day's work for these speedy wagons. Wherever your Walworth Lubricated Plug Valves may be, count on Walworth's Service Fleet to get there . . . fast.

WALWORTH **WALWORTH**

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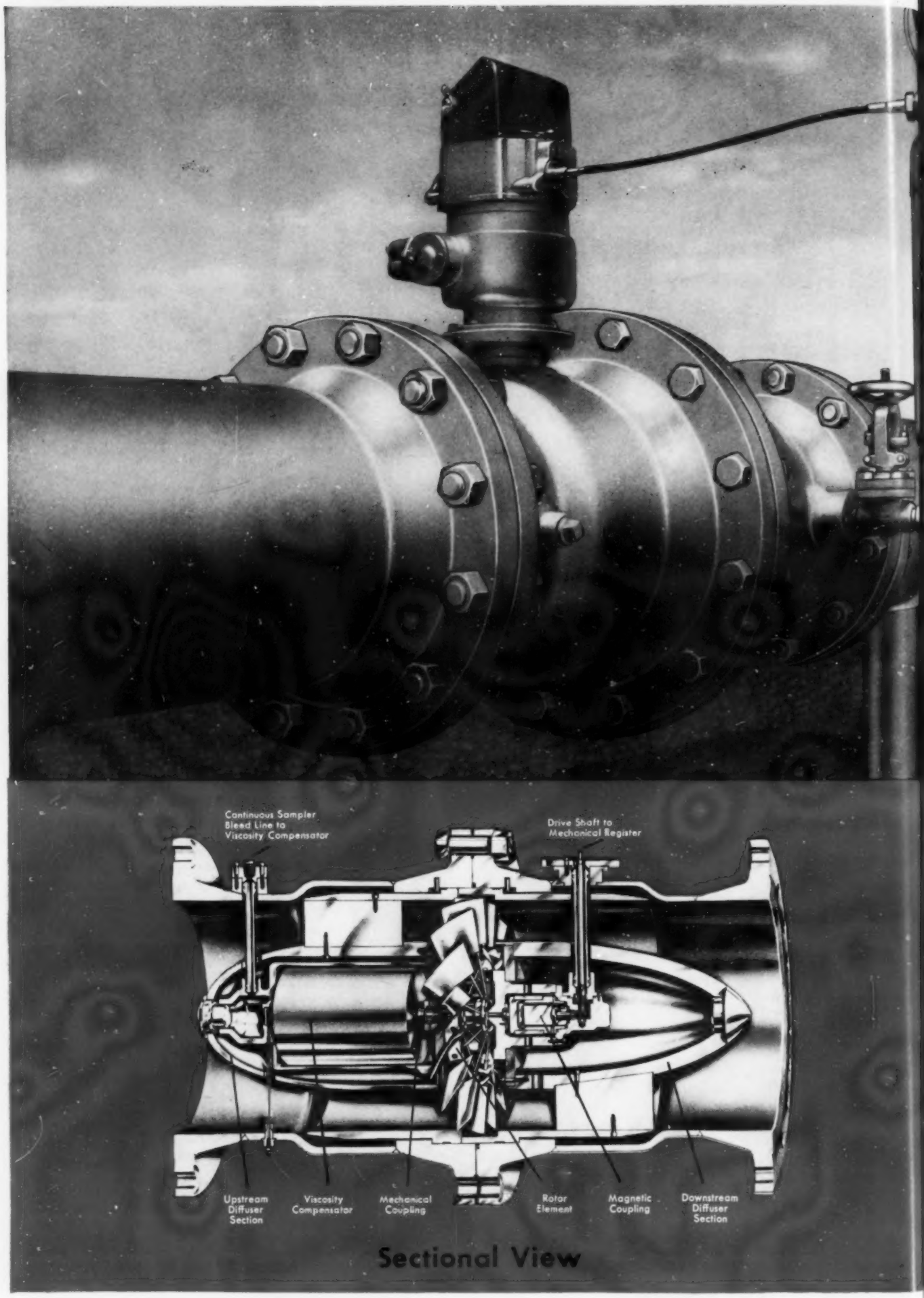
WALWORTH SUBSIDIARIES: Alloy Steel Products Co. ▪ Conoflow Corporation ▪ Grove Valve and Regulator Co. ▪ M & H Valve & Fittings Co. ▪ Southwest Fabricaitng & Welding Co., Inc.


Continuous Sampler Bleed Line to Viscosity Compensator
Drive Shaft to Mechanical Register
Upstream Diffuser Section
Viscosity Compensator
Mechanical Coupling
Rotor Element
Magnetic Coupling
Downstream Diffuser Section
Sectional View

At 7000 bbls per hour they read this Rockwell Turbo-meter 600 miles away–

This Rockwell Turbo-meter is installed on a crude oil line in New Mexico. They read it in California through remote registration with ±0.15 per cent accuracy and repeatability of ±.015 per cent. In addition, an exclusive meter-driven mechanical register provides on-the-spot records for field operators, eliminating all possibility of loss of reading due to electrical failure.

This Turbo-meter measures accurately because only in the Rockwell design will you find a built-in viscosity compensator. The compensator automatically and continuously adjusts the meter for changes in temperature and density. Another exclusive advantage is the wide range of flows a Turbo-meter will handle accurately —all the way down to 20 per cent of maximum capacity. When desired, an impulse generator can be furnished so that measurement can be quickly verified on a ball or piston type fast prover without interrupting the flow.

Before you buy any turbine meter check the savings, the convenience, and all the engineering advances built into Rockwell Turbo-meters. See your jobber or write us. Rockwell Manufacturing Company, Dept. 125H. Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ont.

TURBO-METERS

another fine product by

ROCKWELL

CLIMATE... IS NO OBJECT!

With the UGC Instruments Gravitometer!

CORRECTS AND COMPENSATES FOR VARIATIONS IN temperature — humidity — barometric pressures — dust.

Under any climatic extreme the all mechanical GRAVITOMETER measures specific gravity for use in orifice meter measurement. No *controlled* or *conditioned* atmosphere is required, and there are no complicated or critical adjustments to make for atmospheric variations.

The GRAVITOMETER was designed to eliminate errors in the float-type gravitometer when variations occur in the temperature and density of the atmosphere surrounding the sample float.

The GRAVITOMETER can be installed without the use of highly trained technicians, and is easily operated and maintained. Completely automatic, it produces positive, accurate and correct specific gravity measurements.

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GRAVITOMETER

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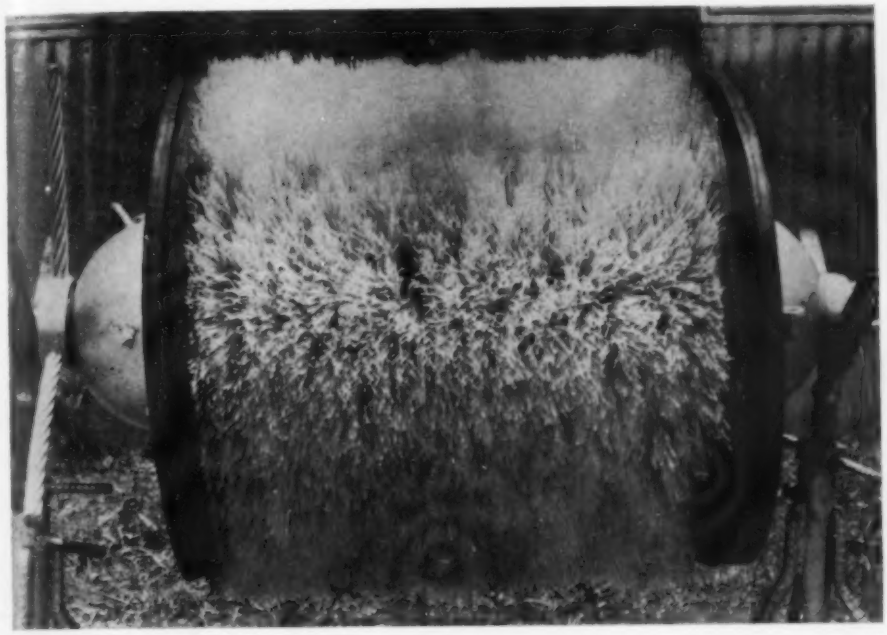
What's New in EQUIPMENT



Plastic Pigs

A plastic pipe line pig, designed especially for internally coated pipe, has been introduced by Pipeliner's Equipment Manufacturing Corporation.

The pig features plastic bristle brushes which will clean, but do not scratch or mar the internally coated pipe. When the plastic brushes become too soiled for successful cleaning, they can be steam cleaned and reused.

The pigs are available in sizes from 2 to 36 inches. The units are light weight (36-inch pig weighs 650 pounds), abrasive resistant, and are not affected by acids, oxidation, solvents, oils or chemicals.

Because of its light weight, the wear on the full segment pig is distributed evenly. Nose of the pig does not drop, and bottom wear on rubber cups is decreased.

It is designed for on stream pigging and is collapsible—being able to go from 36-inch through 30-inch and so on.

(This item supplements Pipeliner's Equipment Manufacturing Corporation data on pages 322-323 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E1** on Readers' Service Card, last page this issue.

Air Compressors

An extensive line of factory furnished accessories is being offered by Le Roi Division, Westinghouse Air Brake Company, for its S2 stationary type air compressors. The products are intended for new installations employing the 25, 50, 75 or 100 hp S2 compressors or for other air systems already in operation. These accessories range from safety switches to dual control system which allows compressor to meet peak demands for air by continuous operation and to take up slack periods with start stop operations.

Accessories are divided into two groups —those that can be installed either at the factory or by the customer and those that are customer installed only.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Grouser Rebuilder

A grouser shoe sprocket reconditioner for rebuilding tractor grouser shoes and drive sprockets is being marketed by Victor Equipment Company. The rebuilder combines automatic flame cutting with submerged automatic welding, providing a completely automatic method of trimming tractor pads, rewelding new grouser bars onto them. The machine also automatically trims worn tractor sprockets and welds new sprocket rings onto the hub.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Hydraulic Pressure Switch

A hydraulic pressure switch with wide range of pressures has been introduced by Square D Company. Pressure is adjustable from 2,000 to 15,000 psi on rising pressure.

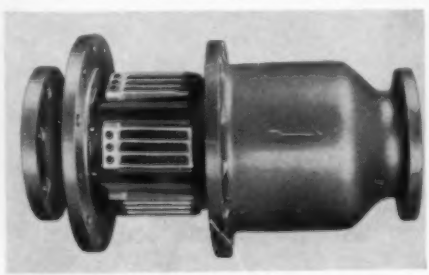
The unit is offered with a one or two-pole snap switch. An indestructible piston, long-life switching member and range-locking nut contribute to low maintenance. The switch is capable of operating rates up to 300 per minute. A strain relief position prevents damage from shock on violent pressure surges.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

Check Valve

Clark Bros. Co. has introduced a new line of check valves designed for use with large volume gas flow. There are no rotating, sliding, hinged or high inertia moving parts. Backflow is controlled by stainless steel leaves retained by keepers.

Valves are designed to be mounted horizontally, vertically, or at any angle in a pipe or compressor discharge line. Offered for pressures up to 1,000 psi, valves are available with cast iron, cast steel, or alloy



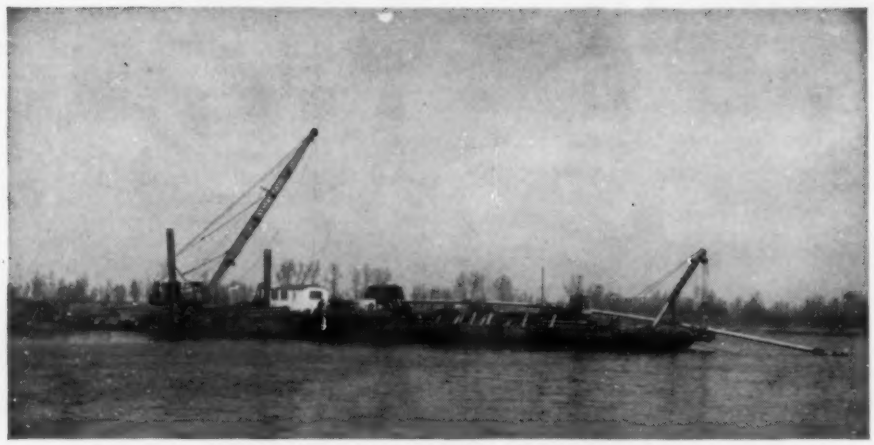
steel bodies in a complete line of pipe sizes from 6 to 48-inches.

(This item supplements Clark Bros. Co. data on page 72 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Thin Wall Bending Machine

An innovation on a standard bending machine provided Crose-Perrault Equipment Corporation with a machine for bending thin wall pipe in sizes up to 36-inch. With the adaption of a standard Lynes, Inc., inflatable packer, which is inserted in the pipe, but operated from the bending machine controls, internal pres-



The three barges at work in mid-river

spi COATED AND WRAPPED PIPE CHOSEN FOR RIVER CROSSING

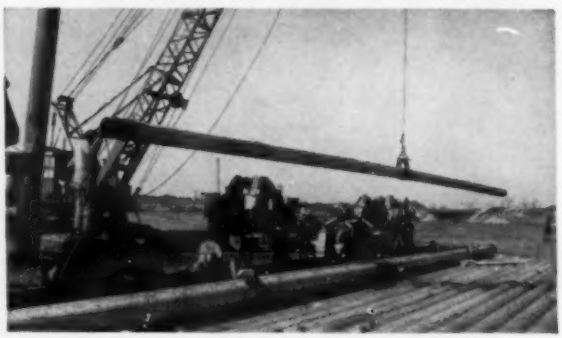
The Mississippi River Transmission Corp. recently laid two 12¾" O.D. pipelines across the Mississippi River just above the Chain of Rocks Bridge at St. Louis. Standard Pipeprotection's coated and wrapped pipe was selected for this important job.

Count on SPI c/w pipe for long lasting pipe protection.

Lowering-in from pneumatic tire cradle

Welding pipe lengths together on the barge

Placing front length of pipe in position on pneumatic tire cradles



standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

sure on thin wall pipe allows it to be bent without a buckling or egging problem.

The packer used on a 34-inch pipe test consisted of twelve 4¾-inch Lynes standard drill packers inside twelve 30 degree segments arranged around an 18-inch pipe core and each packer connected to a manifold by ½-inch flexible lines. The manifold is connected by 1-inch hydraulic line to a skid mounted portable power unit.

On a test with a 12-inch pipe, 0.109 w.t., the pipe was bent 21 degrees using a line packer and applying 300 pounds internal pressure. The bend was smooth with no waves or buckling.

(This item supplements Crose-Perrault Equipment Corporation data on pages 116-117 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

Packaged Gas Compressor

A three-stage air-cooled gas compressor has been developed by Worthington Corporation. The light-weight units can be packaged into portable skid mounted compressors driven by engine or electric motor.

Designed for gathering or booster applications, the unit has a valve with only one moving part, forced feed lubrication, and separator with automatic condensate drain following the second stage intercooler, Oil pressure gage and inter-stage discharge pressure gages are conveniently located on the fan guard.

The compressor is designed for a suction pressure of 0-15 psi and a discharge pressures from 250 through 600 psi. Capacity is up to 145,000 scfd.

(This item supplements Worthington Corporation data on pages 583-586 of the Pipe Line Catalog, Third Revision.)

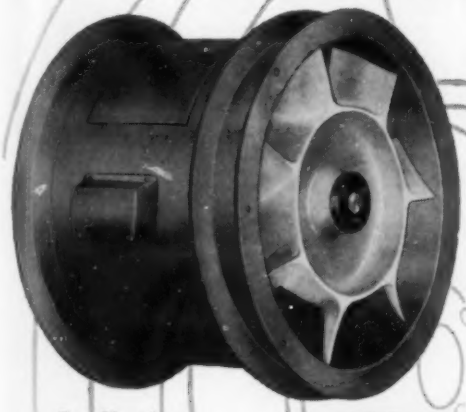
For more data, circle **No. E7** on Readers' Service Card, last page this issue.

Thermoelectric Generator

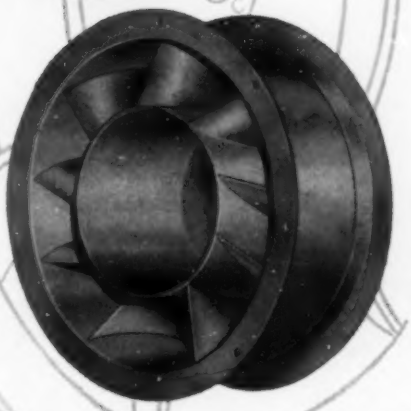
Texas Instruments has developed an 8-watt thermoelectric power generator which contains no moving parts. It will operate from natural gas, propane, or butane and is designed primarily for remotely unattended field installations. Immediate applications are principally for cathodic protection and operation of valves on transmission lines. The generators weigh 65 pounds and are 12 inches wide and 17

another outstanding design development from

Aerovent



Fan Housing



Vane Section

direct-connected
vaneaxial
fans

with removable vane sections

Engineered for high-pressure, high-velocity air distribution systems, these units feature a unique removable vane section which simplifies installation and permits easy access for routine cleaning and maintenance.

Available in 30 models in sizes 18" to 48" for capacities from 3230 to 67,300 cfm with special design features for all application requirements.

Write for Bulletin 475

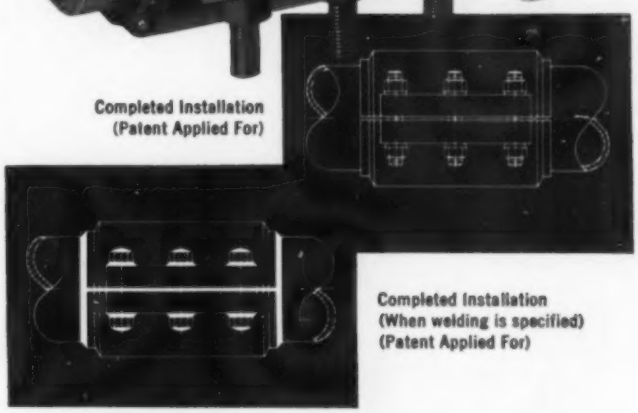
Air deliveries of all Aerovent equipment are tested and rated in accordance with established and accepted codes and each unit is guaranteed by the manufacturer to deliver its rated performance.

CERTIFIED PERFORMANCE

Aerovent

Aerovent
FAN COMPANY, INC.
ASH AND ROTH STREETS PIQUA, OHIO

Pipeline Repairs
are always quicker and
safer with the



Completed Installation
(Patent Applied For)

Completed Installation
(When welding is specified)
(Patent Applied For)

SMITH PLIDCO
SPLIT-SLEEVE

Drastically reduces downtime losses
Permits welding while pumping

Nothing is quicker and simpler than repairing pipeline leaks with Smith Plidco Split-Sleeve. Assemble halves around pipe. Move assembly over leak and tighten side bolts.

Nothing could be safer. Exclusive steel girderings* prevent leaking oil or gas displacing gaskets. Weld if desired.

Stock, use Smith Plidco Split-Sleeves and save! Available in standard pipe sizes. Extra lengths, special dimensions on application.

*Patents pending

THE PIPE LINE DEVELOPMENT COMPANY
5700 DETROIT AVENUE - CLEVELAND 2, OHIO
Representatives Throughout the World

NOW...

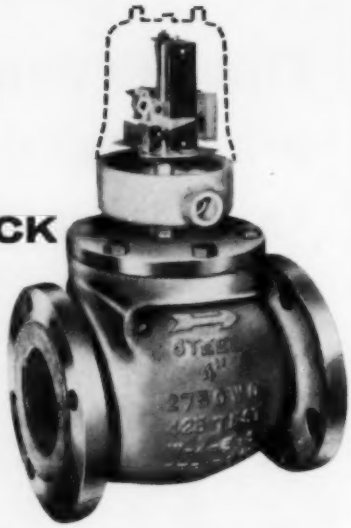
a full-flow

SWING-CHECK VALVE

AND

a FLOW SWITCH

BY



MAGNETROL® model FCV

DEPENDABLE AS THE PULL OF A MAGNET

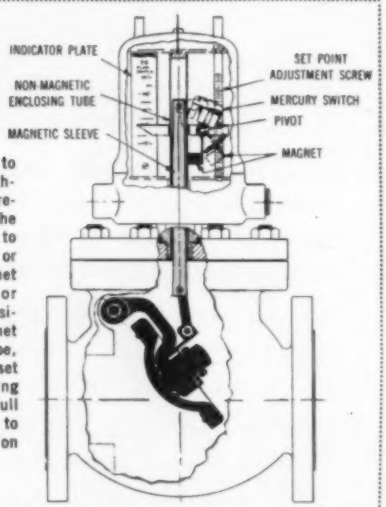
- Remotely Signals Flow–No-Flow
- Interlocks Safety Start-Up or Shut-Down
- Dial Adjustment of Switch Operating Point
- Seals Against Back-Flow

FOR PRACTICALLY ANY LIQUID, TEMPERATURE OR PRESSURE

The new Magnetrol FCV combines a swing check valve with an externally adjustable Magnetrol switch, calibrated for pre-set flow rates. It provides positive flow signal or control at any pre-set valve disc position within 15° to 55° of full closed position. Swing check valve also seals off back-flow — no need to isolate valve from line on shut-down or when changing tanks or lines. Full 90°-swing of disc permits passage of "pigs" or scrapers through line when handling various liquids in sequence, without interrupting flow. Explosion-proof housing, mercury-to-mercury switch contacts, or pneumatic pilot mechanism.

HOW IT WORKS

A magnetic sleeve, linked to the valve disc, is raised within a nonmagnetic pressure-tight enclosing tube as the disc swings in response to flow. This sleeve attracts or releases a permanent magnet attached to a mercury or pneumatic switch. By positioning the pivoted magnet higher or lower on the tube, switch actuation may be set for any point of disc swing within 15° to 55° of full closed position, according to calibrated indicator panel on the switch mechanism.



Mail coupon today for full details—just attach to your letterhead

MAGNETROL, Inc.

5328 Belmont Road, Downers Grove, Illinois

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Please send me catalog data and full information on Magnetrol Swing-Check Valves

Name_____

the all new CURTIN OIL THIEF*

- Easy Opening
- Positive Closure
- Single Line Trip

The new Curtin Oil Thief incorporates a full-opening, side-mounted shutter valve that provides positive closure yet can be cocked with just two fingers. Tripping at any depth can be accomplished by a slight pull on the single line, or the graduated trip rod may be used to actuate the valve at a preset distance off tank bottom.

Precision construction of spark-proof, corrosion-resistant materials assures the user of long, trouble-free service. The Curtin Oil Thief is available in cadmium-plated cast brass or in all aluminum frame construction. Replaceable two-inch barrels of Tempered PYREX®, aluminum or plastic, graduated in ¼-inch divisions, are available in 12-, 16-, 18- or 24-inch sizes.

For full information write for Bulletin T-361.

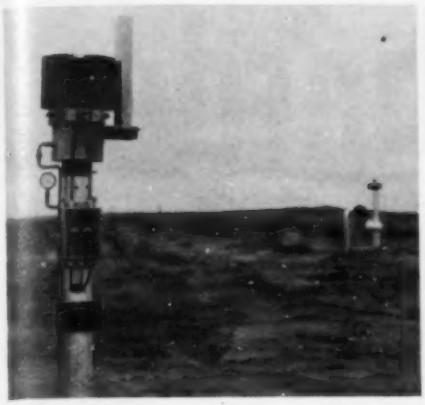
*Patent Applied For

W. H. CURTIN & CO.

CURTIN

LABORATORY APPARATUS, FURNITURE & CHEMICALS

HOUSTON • DALLAS • TULSA • NEW ORLEANS
JACKSONVILLE • BIRMINGHAM • CORPUS CHRISTI
CURTIN DE MEXICO, S. A. DE C.V., MEXICO, D.F.



inches high.

The instrument will be available in power output ranges in addition to the 8-watt model. Generators can be adapted to use any combustible fuel, waste heat and steam or solar heat.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Boring Machine

A gasoline powered horizontal boring unit capable of boring 36-inch holes, has been announced by the Kwik-Mix Co. The machine has a 52-horsepower air cooled gasoline engine, hook rollers and engine base, three-speed transmission and gear reduction with clutch, 9 gpm hydraulic pump powering the feed mechanism; leveling outriggers, track and connecting plates.

The G-160 is a self-contained compact unit featuring stability without auxiliary equipment, accurate control, variable speed and heavy duty construction.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

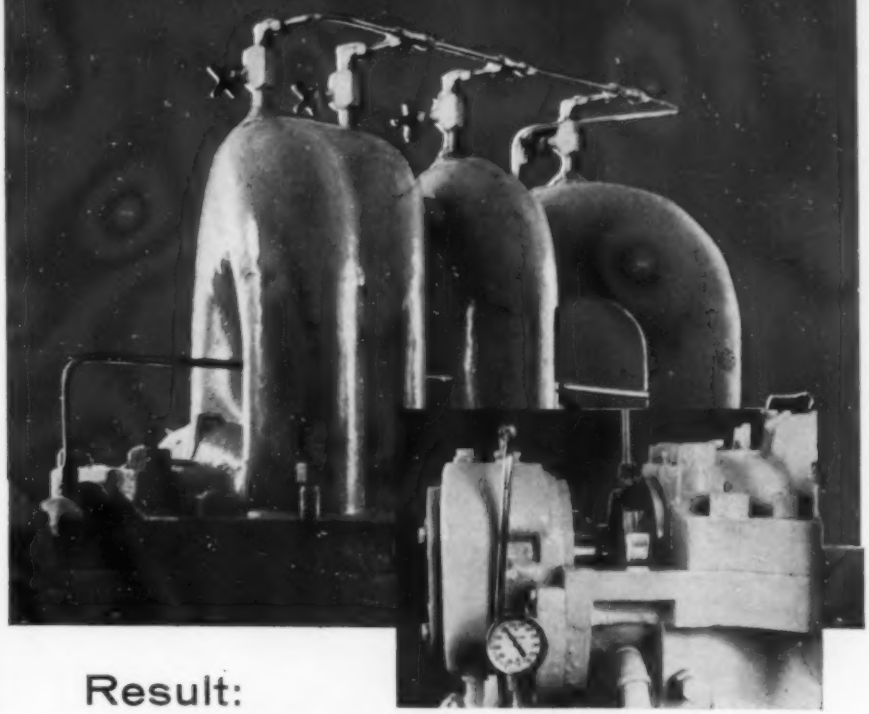
Oil Thief

An oil thief featuring positive closing and easy opening has been announced by W. H. Curtin and Company. It incorporates a trouble-free, full-opening, side-mounted shutter valve, which can be cocked with just two fingers. Tripping is accomplished by a slight pull on the single line or at a preset distance off tank bottom by means of a calibrated trip rod.

Spark-proof construction is of cadmium plated brass or aluminum. The units are available in 24 models in four sizes, 18-24-inch.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.

*Atlantic Pipeline standardizes on Borg-Warner Mechanical Seals with exclusive "Pre-setting Ring"**



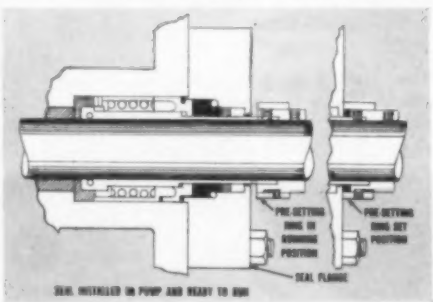
Result:

Up to 50% less maintenance

Since their first installation over four years ago, Atlantic Pipeline Company's Eastern Division has standardized on Borg-Warner Mechanical Seals on main line, booster and calibrating pumps. To date, experience with 26 pumps shows up to 50% less frequent maintenance; a marked decrease in product losses through leakage and evaporation; reduction of hazardous fumes; plus the economy of standard, interchangeable seals. Seals at Atlantic Pipeline's Product System operate under all conditions from inches of vacuum to 1300 psi, with *no pump down time due to seal failure!*

Here's how it works:

Complete Seal unit slips onto shaft—bolts to the stuffingbox. Pre-setting ring is then locked in running position to assure perfect spring tension.



*Pat. Pending

Borg-Warner Mechanical Seals

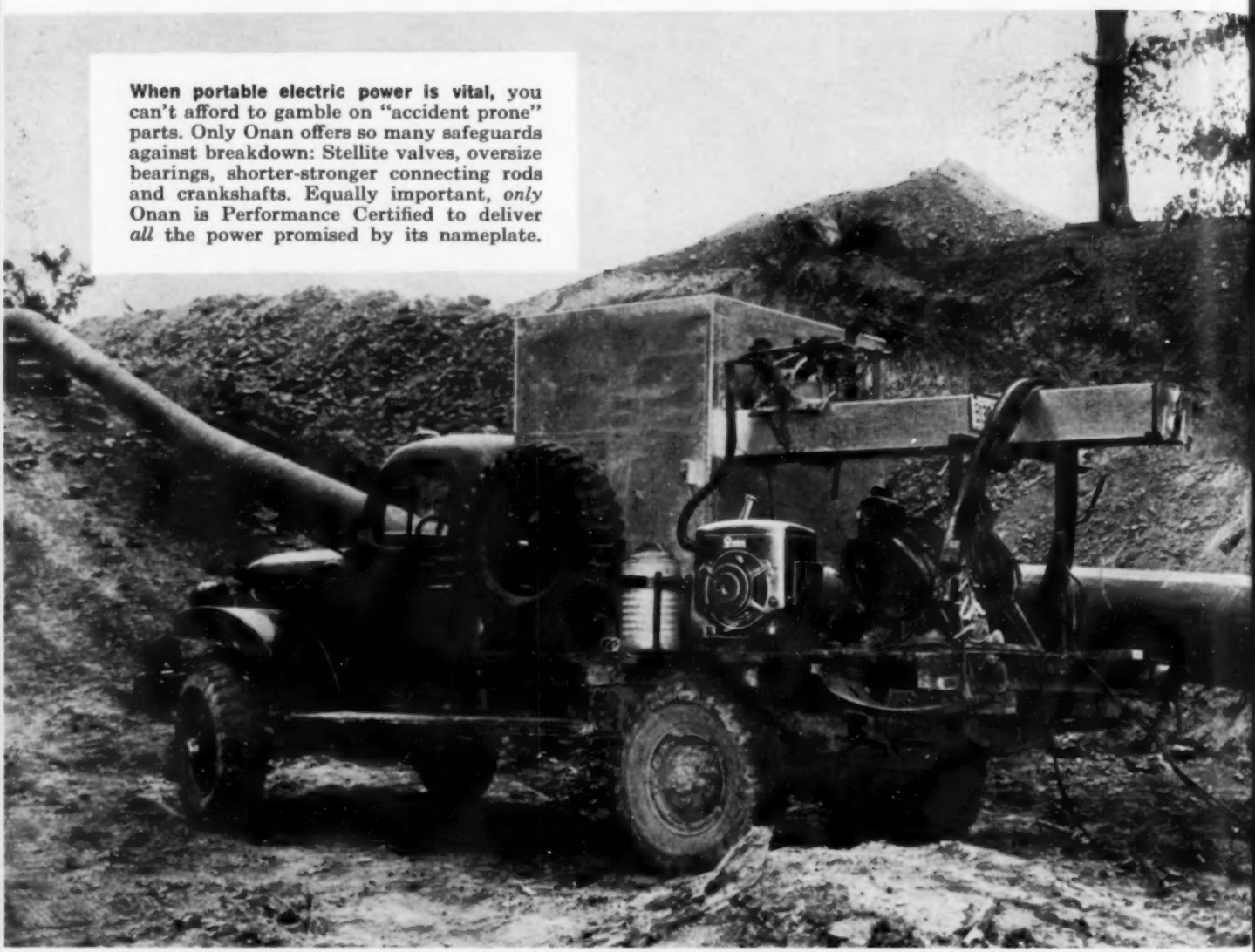
A PRODUCT OF B-W BORG-WARNER

DIVISION OF BORG-WARNER CORPORATION

P.O. Box 2017, Terminal Annex, Los Angeles 54, California

Beefed up for hardest

When portable electric power is vital, you can't afford to gamble on "accident prone" parts. Only Onan offers so many safeguards against breakdown: Stellite valves, oversize bearings, shorter-stronger connecting rods and crankshafts. Equally important, *only* Onan is Performance Certified to deliver *all* the power promised by its nameplate.



Stellite coated exhaust valves and valve seats. One of toughest alloys known. Gives you up to 300% longer valve life than uncoated valves. It's the important details like this that make Onan more economical in the long run.

Exacting standards govern manufacture—years of specialized experience and extensive testing facilities control the quality of Onan Power Plants. Over 1000 different types and sizes of plants are produced by Onan.

t use...even abuse

Onan electric plant still delivers full power after 12,197 hour test—equal to 487,888 miles

A grueling endurance test that lasted one year, nine months and 12 days could not stop Onan test plant #1068. Onan engineers used this production-built unit for an endurance run—and after it was all over, it still generated the full rated power promised on the nameplate. Proof that Onan's exacting standards and production testing give you a power plant with long, dependable life built in.

Over 1,700 other endurance units have been run by Onan engineers. In these tests every design feature and part has to prove itself before it can become a part of the Onan you buy. In addition, every type and size Onan plant is tested under all operating conditions which could conceivably affect performance on your job.

Hours of running in and testing under full load are given *every* Onan before it is shipped. An independent testing laboratory then spot tests Onan Plants that have already been tested by Onan—double assurance that every Onan will deliver its full nameplate rating. Only then does an Onan production run qualify for Performance Certification.

Buy *proven performance* when you buy an Electric Plant. See your authorized Onan distributor or dealer. You can depend on him for a lifetime of factory parts and service. He's listed in the Yellow Pages.

ONLY ONAN GIVES YOU THIS CERTIFICATION

Onan
Onan
PERFORMANCE CERTIFIED
We certify that when properly installed and operated this Onan electric plant will deliver the full power and the voltage and frequency regulation promised by its nameplate and published specifications. This plant has undergone several hours of running-in and testing under realistic load conditions, in accordance with procedures certified by an independent testing laboratory.

World's Leading Builder of Electric Power Plants

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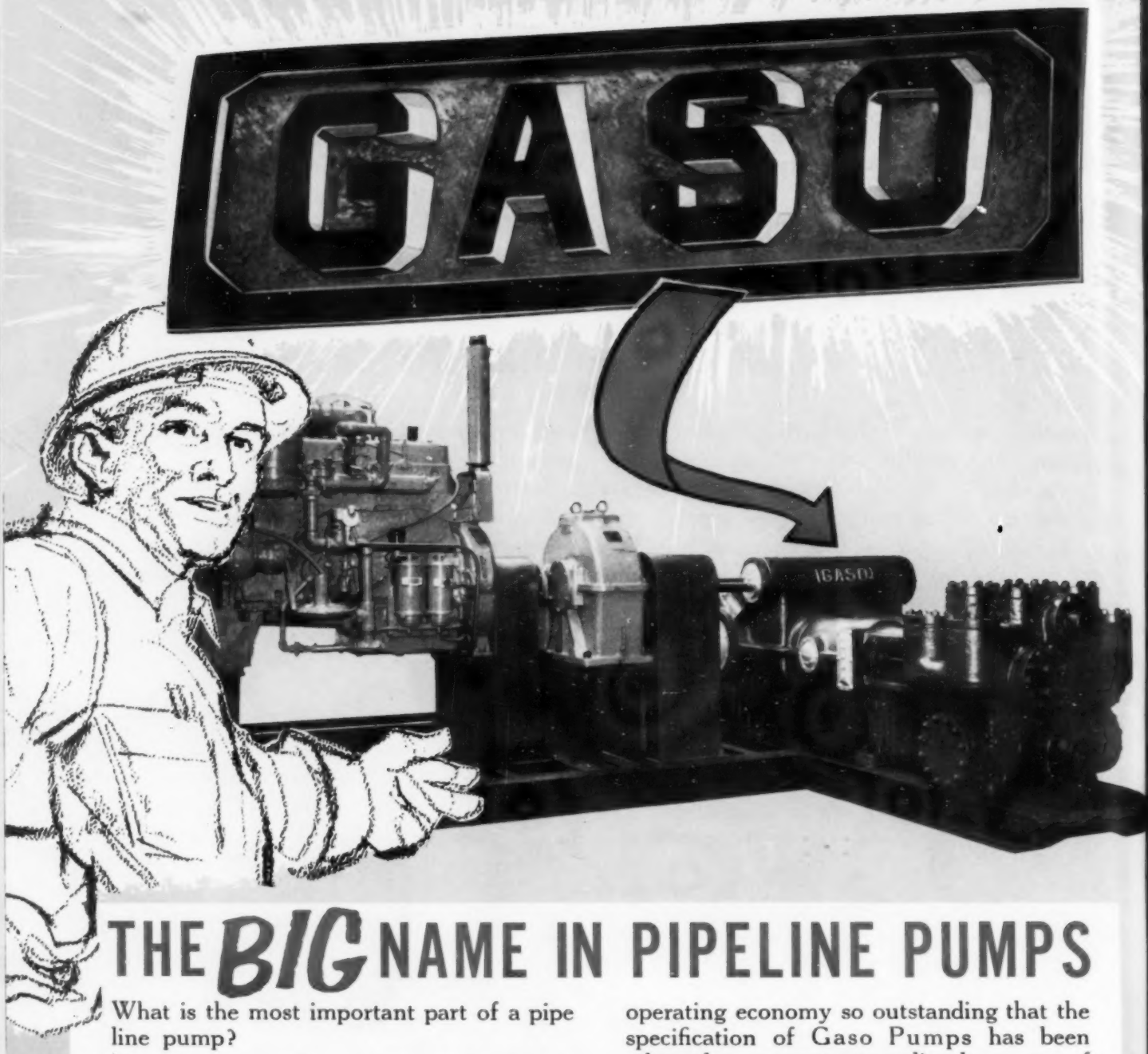

THE *BIG* NAME IN PIPELINE PUMPS

What is the most important part of a pipe line pump?

The name on the pump, and what it stands for.

Discuss pumps with any group of pipe line engineers and they will tell you no name is seen more often in the field, or commands more respect, than GASO.

Why? Because these men know from experience that the GASO name stands for engineering, performance, life and operating economy so outstanding that the specification of Gaso Pumps has been adopted as a corporate policy by many of the world's best known, best managed pipe line companies.

Add to the assurance of top performance the convenience of fast cooperative service from close-by distributors, and you begin to understand why GASO is the big name in pipe line pumps.

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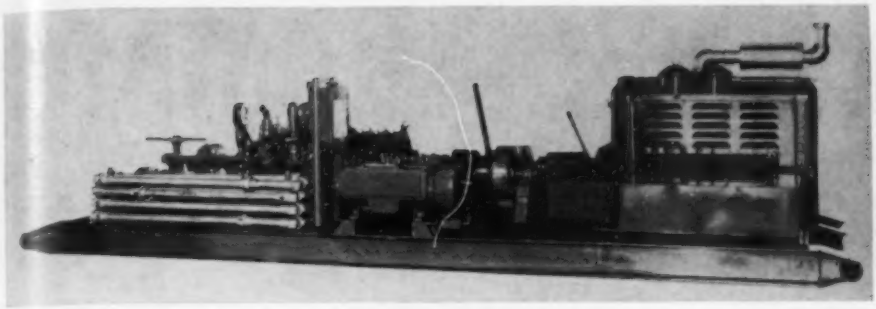
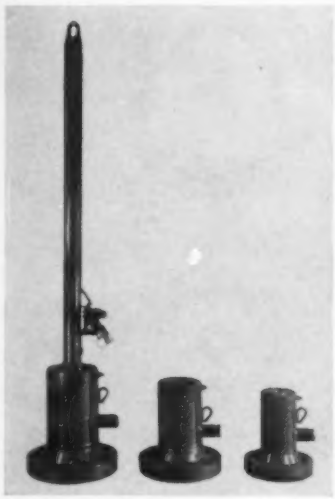


Hydrostatic Testing Unit

A self-contained hydrostatic pressure testing unit for pipe lines has been developed by Apex Machine and Manufacturing Company. The units, 6201 and 6202, are powered by a diesel engine which drives the centrifugal fill pump and quintiplex high pressure pump. The centrifugal pump is coupled directly to the diesel engine and runs at all times that the power unit is in operation. The quintiplex pump is driven off the diesel unit through roller chain and sprocket speed reducing drives.

The unit can deliver 800 gallons of water per minute at 300 psi when engine is developing maximum power. A single unit composed of a pressure recorder, flow meter, and totalizer is provided. The units are skid mounted on heavy duty H beams.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.



Plugging Machine

A pipe line plugging machine, Stopple 11, has been developed by T. D. Williamson, Inc., The unit consists of three sections—a hydraulic cylinder, plugging head and a housing. A single hydraulic cylinder operates plugging heads of several sizes.

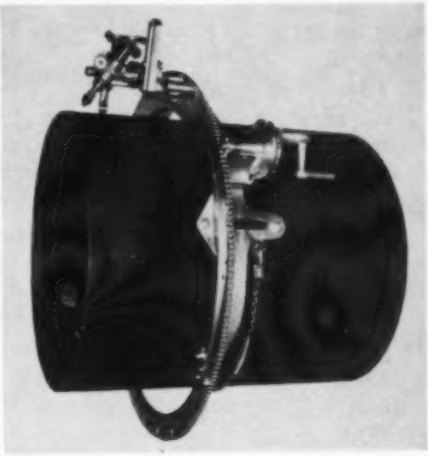
The stopple is used to isolate a section of the pipe for repairs or additions without shutdown.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.

Inspection System

A television system for complete inspection of pipe lines has been introduced by Inspectoline Incorporated. The water-tight system is complete with an enclosed lighting system, 500 or 1,100 feet of cable, and generator. It can be pulled through lines from 4 through 48-inch diameter. Sales price is $6,500 and up.

For more data, circle **No. E13** on Readers' Service Card, last page this issue.



Beveling Machine

A compact design features this new pipe cutting and beveling machine developed by Crose-Perrault Equipment Corporation. The machine will cut and bevel coated pipe with reduced cutback. A full circle traveling ring cuts and bevels pipe simultaneously.

The unit comes in several models to handle pipe from 1½-inch through 48-inch. Adaptors are available for conversion to double cutting machines. Torch holder will accommodate any standard machine cutting torch. The machine is a light weight unit constructed of aluminum alloy.

(This item supplements Crose-Perrault Equipment Corporation data on pages 116-117 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E14** on Readers' Service Card, last page this issue.

Backhoes

Three new backhoes for utility tractors have been announced by Parson Co. Models include the 1,000 with a digging capacity of 10 feet; the 12-foot, 1,200 and the 13-foot, 1,300.

Units feature "Hydaway" hydraulics with cylinders, pistons, and hoses enclosed and protected (except the 1,000); 3-position dig-all bucket; non-skid stablizers; safety locks on boom and swing; and full 180 degrees swing.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

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QUICKLY
PERMANENTLY
ANY PRESSURE
ANY TEMPERATURE

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EMERGENCY PIPE CLAMPS for safe, sure lasting repair of splits and rust holes in pipe. No pressure too high. Anyone can apply in a few moments. Made in all sizes, ½" to 12", for steel and C. I. pipe. Stocked by practically all oil supply stores.

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For more data on advertised products, use cards, last page.

"200 Joints—16,000 ft. regular, with our two

—A. E. "Abb" Campbell, Welding Foreman,

"For years, pipeliners have been trying to mount welding equipment on crawler tractors, to speed up the tack-welding operation at the front end," states welding foreman A. E. "Abb" Campbell, for J. P. Neill & Co., Inc., Dallas, Texas.

"Now, with the two International TD-15 Pay Welder units fitted up the way we want, we have the smoothest tack welding crew in our experience. Two-hundred joints and 16,000 ft. of pipe daily are regular performance."

Action views show work on 34-inch coated P. G. T. Co. pipeline near Pasco, Washington.

Factory-engineered, factory-built, and factory warranted, the Pay Welder is a high-output 325-amp. unit. It's powered and carried by the 6-cylinder TD-15 crawler tractor. Unit consists of two Lincoln dual welders (4 welders) with four welding leads—V-belt driven from front p.t.o.

Internal clamp-actuating air compressor, front p.t.o. driven, is mounted on the front extension steel platform—tote line-up clamps and supplies on the equally-rugged, built-in rear platform. "Float" this self-contained 74-inch gauge outfit on 24-inch track shoes for swamp duty—its "vitals" are thoroughly sealed from dirt and moisture.

And the new 151 Series TD-15 has other features like new, greater capacity cooling—new 99.8% efficient, 100% convenient, dry-type air cleaner—new undercarriage and transmission strength, for uninterrupted pipelining under roughest, toughest conditions.

Compare capacity—efficiency—on-the-job availability! Prove to yourself how decisively the International Pay Welder outperforms and outearns any outfit of its type, anywhere. Measure other plus advantages like Dura-Rollers—International's 1,000-hr. lube interval track rollers protected by improved, high-efficiency full-floating seals. Let your International Construction Distributor demonstrate!

International® Construction Equipment

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

Note that the front Pay Welder on this J. P. Neill & Co., Inc. job carries a front p.t.o. driven air compressor to supply air for the line-up clamps.

Dual booms on this unit permit Neill Company men to make two welds at once, a pipe-section apart. "The International Pay Welder units are functioning perfectly," reports Spread Supt. Jack Hayes. "They have helped make the best tack weld operation I have ever seen."

# of pipe daily...
Pay® Welder units"

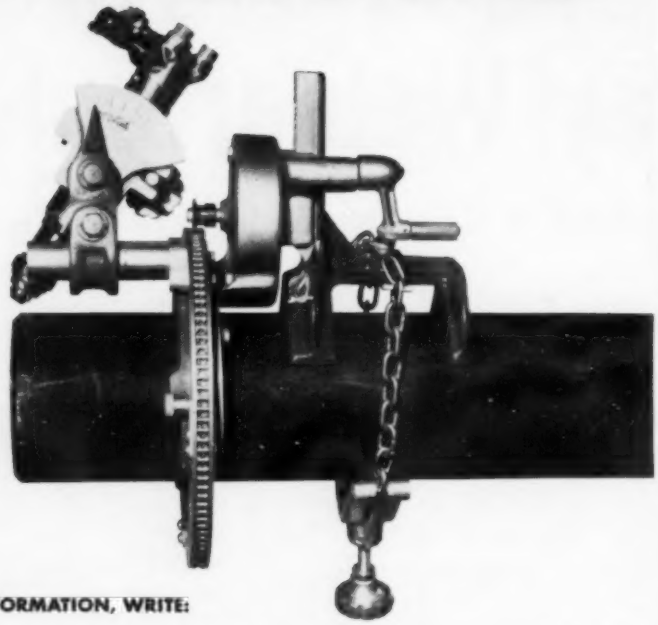
J. P. Neill & Co., Inc. Dallas, Texas

A. E. "Abb" Campbell, welding foreman, credits Pay Welder rigs with giving Neill Company the smoothest tack welding crew ever—making 200 joints on 16,000 ft. of pipe, daily!

RIGID! ACCURATE!

CROSE–PERRAULT MODEL "O" BEVELING MACHINE

Crose-Perrault's small size model "O" beveling machine will cut and bevel small diameter coated pipe from 1½" to 4". Only one adjustment necessary to change pipe size settings. A full circle traveling ring cuts and bevels pipe simultaneously to assure accuracy. This ring eliminates jerky movement and insures a cut so smooth that buffing costs are negligible. Easy to install on closed section of pipe. Light weight, rigid, constructed of finest aluminum alloy.



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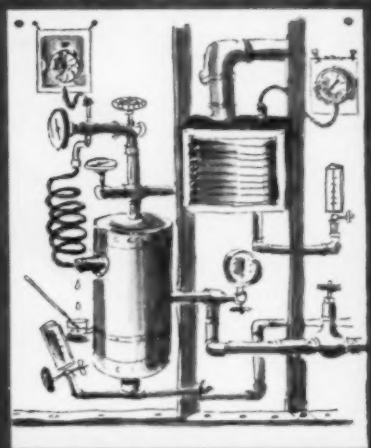

Why the confidence? We have manufactured literally *MILLIONS* of different types of instruments for measuring and recording temperature, pressure, humidity and time-of-operation. More than likely, the special you're looking for has been produced by *Weksler*. At worst, your problem will prove routine for our engineers.

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Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Readers' Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

Mechanical Anchors

A new 12-page catalog on mechanical anchors for pipe lines has been published by Petroleum Anchor Equipment, Inc. The corrosion resistant Natchez anchors have permanent square heads on all anchors for faster installation and are nickel plated from head to pilot to combat corrosion.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Four-cycle Engines

Cooper-Bessemer Corporation announces a four-page bulletin describing the operating characteristics of its 12 and 16-cylinder supercharged LSV engines. The four-cycle engines can be provided for various fuel requirements—gas, straight diesel, dual fuel or tri-fuel.

The brochure also describes Model ET turbocharger used on the LSV. This unit is driven by exhaust gases and is lubricated and cooled from the engine systems.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

Dry Scrubbing

An illustrated bulletin describing the centrifugal methods of dry scrubbing developed by Aerotec Industries for natural gas has been issued.

It contains dimensions, capacity charts and formulas. Units up to 1 million SCFD may be manifolded to any capacity. The bulletin includes information on the Mist Extractor for use where excessive slugs of liquid are present in gas.

To get a copy, circle **No. E18** on Readers' Service Card, last page this issue.

Engine Lubricant

The story behind a new oil for gas engines is told in Humble Oil & Refining Company's brochure, "The Story of Estor G."

Estor G is an intermediate-VI, naphthenic base lubricant with detergents and inhibitors. It is designed for performance on two-cycle and four-cycle engines.

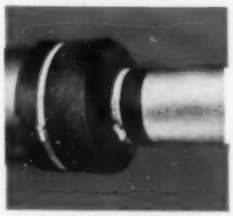
To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

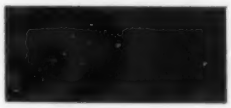
Dynamaster Recorder

An illustrated bulletin on the advantages of simultaneous recording of four independent variables on their four-pen electronic dynamaster recorder has been published by Bristol Company.

The two-page fact sheet includes specifications of the models and photographs of components.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.





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IRISH Casing Seals come in any pipe size combinations. All sizes available with zippers.

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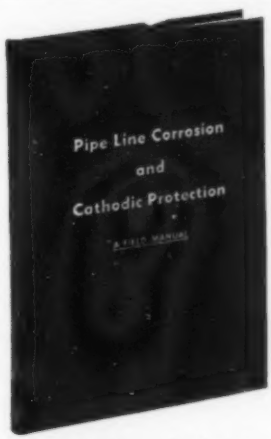

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By MARSHALL E. PARKER

This book is designed as a practical field manual. It provides workable methods that can save you valuable time and effort in obtaining interpretive field data.

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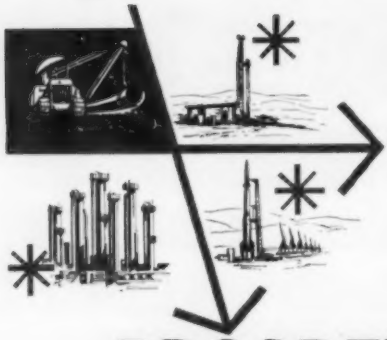

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New Manual N-71 containing complete operating data.
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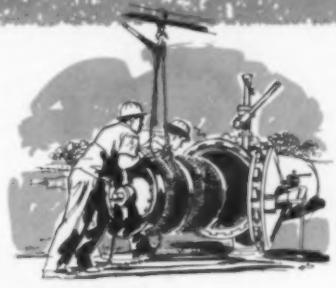
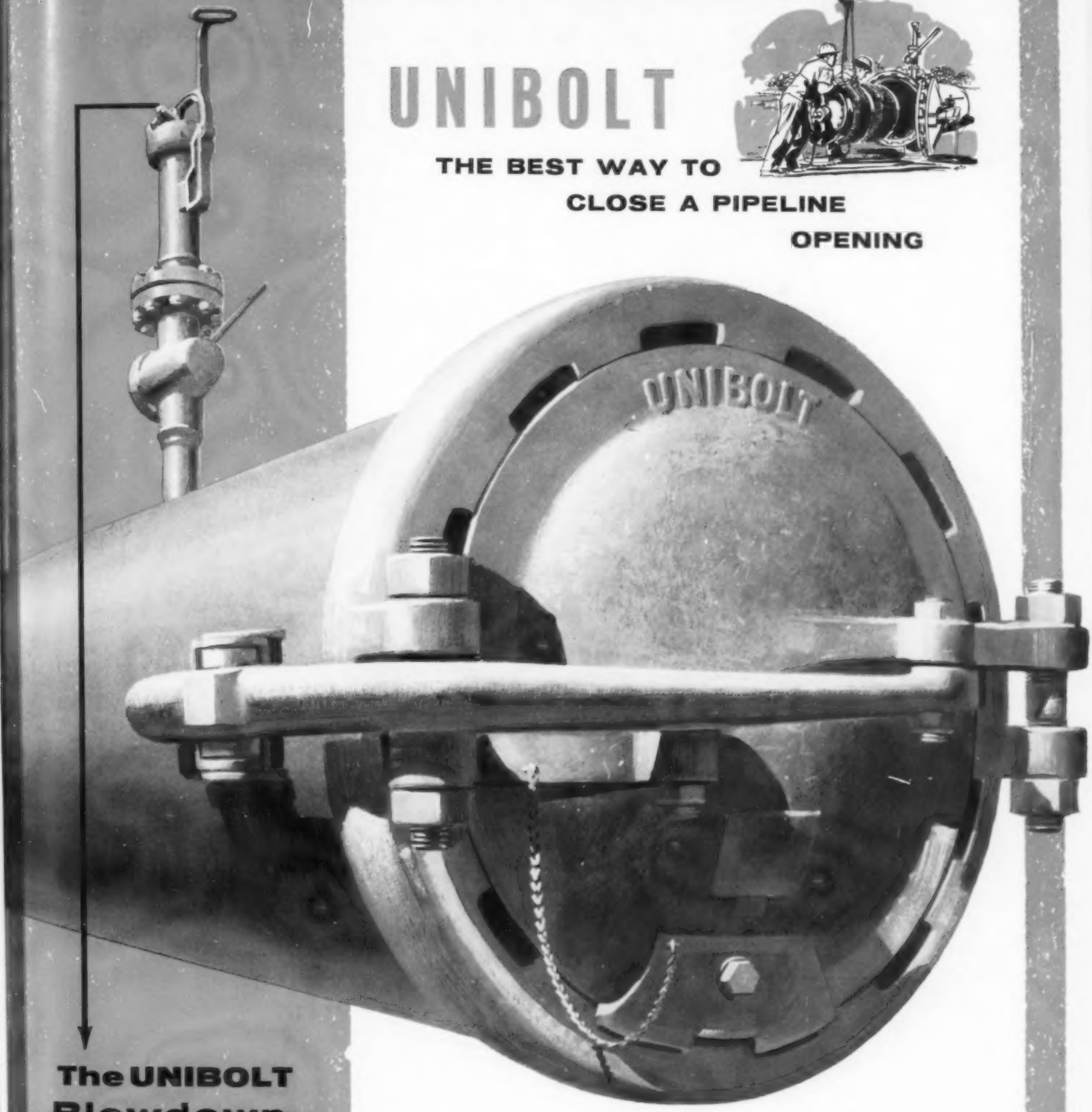
THE BEST WAY TO CLOSE A PIPELINE OPENING





The UNIBOLT Blowdown

is equipped with a UNIBOLT Closure on a cantilever hinge for easy opening. A bleeder plug is provided for safely relieving pressure that may leak thru the riser valve.

UNIBOLT Hinged Scraper Trap Closures are easier to open—only two bolts to release. No heavy lifting, nothing to fall on workmen. They are the safest of all closures. The nut-lock must be released before the closure can be opened, and releasing the nut-lock automatically bleeds off any pressure that may be trapped in the line. They swing open and shut on a sturdy hinge. An oil-resistant, resilient, self-sealing gasket provides a pressure-tight seal and seldom, if ever needs replacement. Overtightening the closure bolts cannot damage the gasket.

Complete details and specifications on these and other UNIBOLT products for the pipeliner are carried in Bulletin PL-600, a copy of which will be sent on request.

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P. O. Box 1184, Houston, Texas

62 GROVE G-4 MAINLINE VALVES IN THE ALBERTA-CALIFORNIA LINE

Throughout the 1,018 miles of its 36″ section, the new Alberta to California natural gas pipeline uses Grove Series G-4 mainline valves. These valves are among the largest full-opening mainline valves ever put in service. They feature the field proven patented Grove Seal-"O"-Ring® design, with its "double-barrier seal." A positive, primary metal-to-metal seal is backed up by the squeegee and sealing action of protected o-rings, to assure a bubble-tight seal, easy open and close. Because G-4 valves do not rely on sealing compounds, they completely eliminate all maintenance costs relative to lubrication. Call your nearest Grove office and learn how Grove pipeline valves can serve and save for you in your next pipeline.

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